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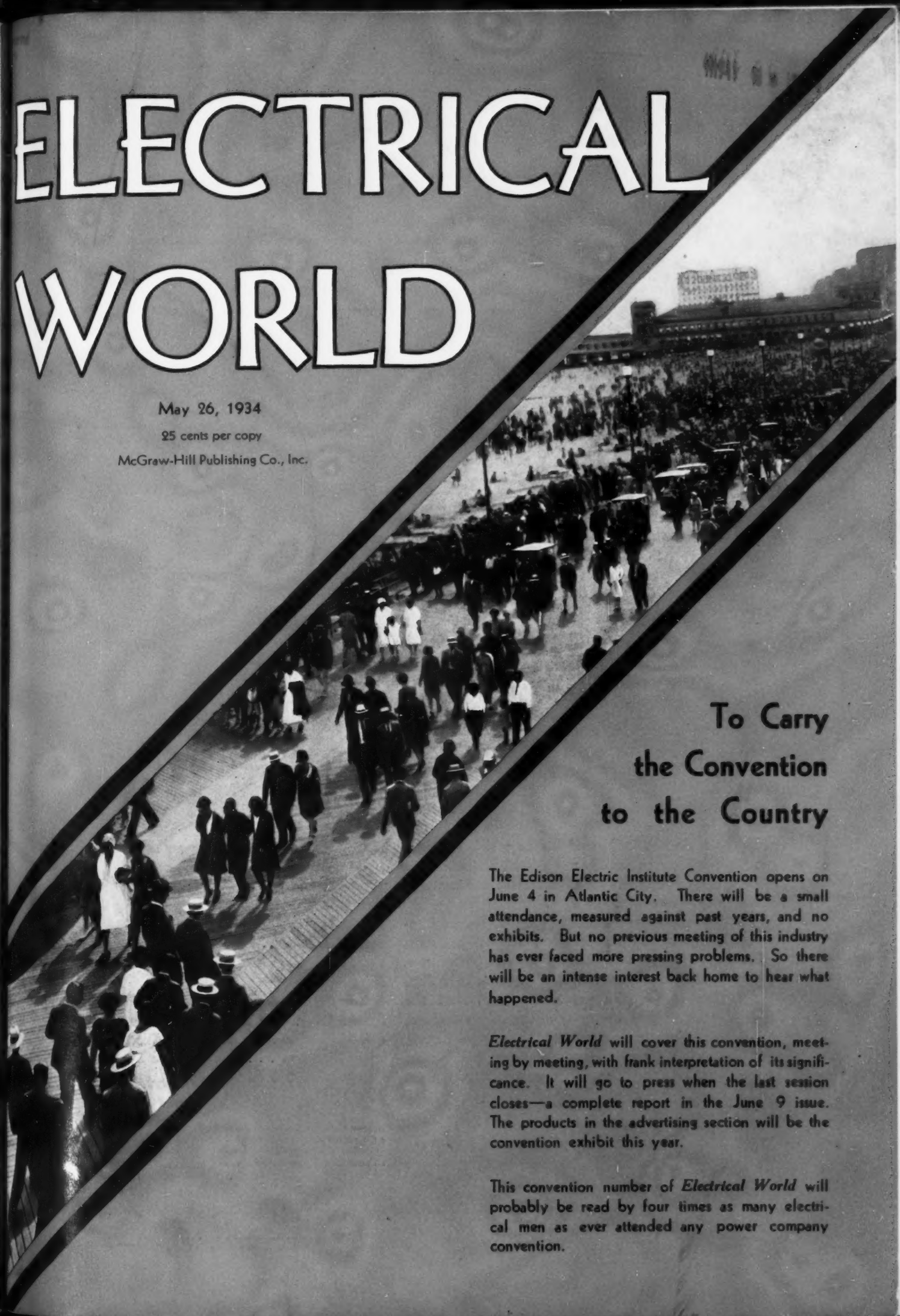

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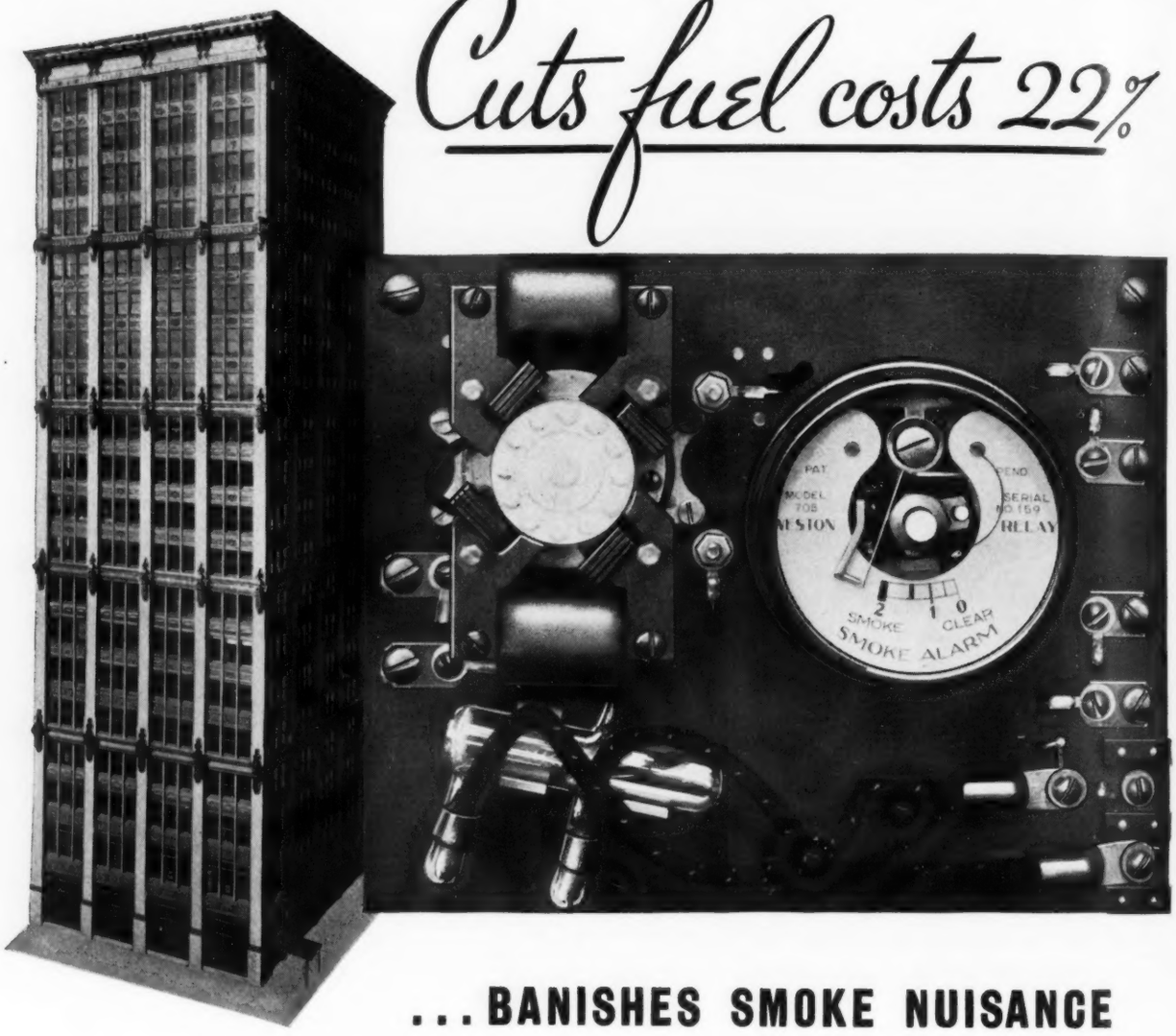

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ELECTRICAL WORLD

Established 1874—McGraw-Hill Publishing Company, Inc.

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May 26, 1934

L. W. W. MORROW, *Editor*

Reassurance for Utility Investors

WHAT is going to happen to the securities of privately owned utilities? What is to be the ultimate fate of funds now in power company stocks and bonds? These questions were debated at the meeting of the National Association of Mutual Savings Banks last week. The bankers were apprehensive. They were disturbed over the probable effect of rate reductions, higher taxes, hostile legislation and government competition. They wanted to know what action they should take to protect their investments.

The meeting was addressed by such speakers as David E. Lilienthal of T.V.A., President Woodworth of the New Hampshire Savings Bank and Samuel Ferguson. It was the final consensus that the light and power business would continue to grow and expand and need new capital. But it was held vital that investors in senior securities of operating properties should be protected, that government and municipal competition should be fair and not confiscatory. To this Mr. Lilienthal agreed, saying that no competing facilities would be constructed in the Tennessee Valley "until every reasonable alternative has been exhausted."

The meeting was constructive. Here were many bankers thoroughly concerned over the situation and talking it out frankly. They registered a definite note of confidence in operating properties that should enhance the credit of utility companies. They made some definite suggestions to utility managements — shorter maturity on bonds, sinking funds to retire them, uniform accounting that will show more facts to investors.

But the finger of doubt was pointed at the holding company and its bonds and stocks. The value of such issues and the integrity of holding company managements were challenged. And while it was admitted that there must be good and bad holding companies, the impression prevailed of weakness in holding company securities.

The present plight of holding companies is apparent to all fair-minded men. Investors are bitter because they have suffered severe losses, and it does no good to remind them that in most cases they bought the securities as a speculation and should be good losers. Facts should be faced and action should replace inertia. The situation cannot be left to time for curing. Capitalization should be scaled down where necessary, in line with present investments and earning levels. Pyramided organizations should be simplified. Management and financial policies should be adjusted to the new conditions.

MANY holding companies have done and are doing these things. The others will follow. It is not easy, but it is of vital importance if the present distrust is to be dispelled. Executives of holding companies must win back the good will of the public and the investors. To do so they should put the cards frankly on the table.

The light and power industry is sound. As the distinction between operating and holding company securities becomes more generally understood much of the present doubt will disappear. The managements of holding companies have learned their lesson and the house cleaning is in process. Operating companies have a good record. Executives of both operating and holding company must now work together to build back on a progressive program. A show of courage, purpose and leadership will win back public recognition and restore the confidence of the investor.

This Grounding Problem Halts a High-Frequency Tool Use

When a foundryman is ready to drop air tools for cleaning his heavy pipe castings, in favor of high-frequency electric grinders and chippers, it is unfortunate that he should be deterred by doubts of safety. But there appears to be some basis for his hesitancy with regard to protective grounding. One foundryman wanted to avoid increasing his tank capacity as a means of preventing the drop of pressure and slowing of cleaning operations when several grinders and blowers drew air simultaneously. Bids were asked on high-speed high-frequency tools and he expected to have no higher than 110 volts to contend with. When the tenders were received they covered 220-volt equipment.

The pipes to be cleaned of fins, scale and core skin are, in this instance, laid horizontally on rails that rest on wooden posts set in the ground under a shed. No feasible and trustworthy means of grounding the rails and pipes is apparent. The proprietor fears for his employees, who, all perspiration at times, have to work in cramped positions inside the long pipes. This constitutes a pronounced electrical hazard—in case of insulation breakdown within the grinder motors or in case of chafed insulation and protection on the worn leads—unless grounding can be made positive and permanent. Adequately reassured on this point, there is no doubt that the prospect would become a convert to the electric way. Somehow no one has so far given him the convincing answer to his wholesome doubts. A bit of simple engineering counsel could justifiably have been tacked onto the sales proposal, but it wasn't and so the deal languishes. Can any one now convince the foundryman?

Electrometallurgy for Better Steel Products

Steel for automobiles, oil refining, tools and dies, bearings and aircraft has become specification material of a precise kind and quality. The production of these steels has afforded a new market for the electrical industry because the electric furnace possesses the characteristics necessary to production. Yet the business lags in this country. Over in Great Britain many thousands of kilowatts of high-frequency, 1,250-cycle, electric furnaces are in operation, the largest rated at 5 tons, having been installed recently.

For refining steel and steel alloys definite proof exists that carbon, manganese, silicon, sulphur and phosphorus can be removed and slags can be made to permit specification refining quite readily. These furnaces can make heat-resisting, alloy, stainless, non-magnetic, permanent magnet and nitrogen hardened steel.

This business should be developed more rapidly in this country and the electrical industry can well afford to get behind its promotion. As a parallel movement the electric furnace should be introduced more universally into the gray iron foundries. The days of the old-fashioned and wasteful cupola are passed, but this must be shown in terms of cost, quality and performance. It can be done, but the electrical industry must do the work if a rapid growth is to be had.

Improved Demand Charges

Industrial customers often concentrate their thinking upon the power company's demand charges. One large utility not long ago changed its schedule of demand charges to factories from a yearly to a monthly basis of measurement and billing. The resulting dilution of peaks reduced the demand billing prices to many factories from 15 to 40 per cent. This utility then stated that it had revised that portion of its industrial rate structure in order that power costs might fall more closely inside the range of fluctuating business volumes now being experienced by that class of customers. The demand charge per kilowatt was increased, but the basis of determination was modified by the adoption of monthly figures in place of annual peaks as yardsticks. The minimum energy rate was made available earlier in the higher blocks.

The power company took good care to explain what it had done and the benefits received by its manufacturing customers. It lost some business where industries were disposed to gamble on the reliability of private plants, but it knew the margins at stake and the risks of depending on old apparatus or on untried designs in other cases. Some business thought lost returned; the great bulk of industrial patronage was held intact, and intimate knowledge of border-line conditions by the power sales department proved worth many times its cost.

T.V.A. and the Investor

An Energetic Defense of Government Yardsticks Before the National Association of Mutual Savings Banks in New York Last Week

By DAVID E. LILIENTHAL
Tennessee Valley Authority

THE protection of the investor is a matter of immediate concern to your national government. As you know, the President, on several occasions, has expressed his views upon this subject. Under his leadership legislation has been enacted, and other legislation is pending, designed to protect the investor. The credit agencies of your government have fought a gallant battle for the institutional investor. Other federal departments have been working to the same end. In common with these national agencies, the Tennessee Valley Authority, within the sphere of its own operations, is likewise committed to a policy of protection and of fair play for the investor.

Savings banks, insurance companies and fiduciary institutions of various kinds supply a major portion of the capital for this extensive industry. This capital is secured at a very low interest rate. The senior securities of well-financed operating utilities yield a rate of return comparable with that of municipal bonds. These senior issues have been generally regarded as attractive by investment bankers, and have been widely recommended for bank and trust fund portfolios. But in the face of the fact that these institutional investors have supplied billions of capital to the electric utilities at a low return, the voice of the senior security holder has rarely been heard in the management of public utilities properties. The fate of billions of dollars of senior securities is determined by the policies of a small management group holding but a negligible fraction of the common stock, and with little of their own money at stake. The fate of your billions of conservative capital has been put into the hands of a managerial minority. Have they justified your trust and confidence? We all know that some have, and their record is a matter of pride to business men everywhere. But these bright spots are not typical. The record of these management groups as a whole is not creditable.

The record shows that important common stock management groups have in effect been steadily confiscating senior security values. Your investment has been sapped in a variety of ways. Turning to the consolidated surplus account in the annual reports, pages 32-33, of the Commonwealth Edison Company, we find that the directors of this organization in a single year found it necessary to write off over $45,000,000 against surplus, reducing the surplus from $53,500,000 to $6,900,000. Some of the items in this write-off against surplus deserve your attention. In the first place we find a so-called investment reserve of $30,000,000 set up. It appeared that the management of this company, through a non-utility investment subsidiary, had been making enormous outlays in all manner of enterprises, from truck factories to suburban real estate, investments which every one here would agree no conservatively operated quasi-governmental business should have considered. The reserve was to absorb the losses of those ventures. Even that investment reserve was found inadequate, for in the 1933 report we find an additional charge of $7,000,000 against surplus to care for shrinkage in value of the so-called investments of the subsidiary. Some of the other items in this surplus account are interesting. Here is an item of $3,750,000 for "losses in connection with transactions in company's reacquired stock." This company, through its subsidiary, was engaged in the practice of buying the company's stock in the open market, for purposes which do not stand very close scrutiny, when taken in connection with the management's intensive stock-selling campaign among customers and helpless employees. Then there is an item of $1,665,000 for "advances and loans of stock to officers and employees and to individuals connected with affiliated companies."

Does the T.V.A. threaten the investor in private utilities? Mr. Lilienthal makes a positive and outstanding statement that it does not. He makes charges of bad management against private utilities. In his opinion federal action was forced by utility abuses. Here is a controversial topic treated bluntly.

Let us turn now to the annual report of the Public Service Company of Northern Illinois. Here we find that in 1932 and 1933 the management wrote off a total of $18,500,000 to take care of the shrinkage in value of securities in all manner of outside enterprises, similar to those of Commonwealth Edison. Charges against the reserve included a half million dollars in advances

and loans to officers and employees and to individuals connected with affiliated companies, and $1,750,000 in connection with losses in stock market operations involving the company's own securities.

I need hardly point out that I am not criticising the write-offs put into effect by new management, but rather the financial policies extending over a period of years which made that action necessary.

These reports tell a story of confiscation of values of senior securities. Furthermore, the effect of this management policy has been to make rate reductions much more difficult for these companies, and to that extent has made the general public relations of these companies less favorable. All of this reacts adversely to the holders of the bonds.

I wish those were the only instances in which senior security values have been confiscated by management policies. You and I know that the instances are legion. Another common method of confiscating senior security values has been through the abuse of the management and engineering fee. By this device the common-stock holders of an operating company were able to draw off not only a generous dividend on their stock holdings, but additional compensation for alleged services. Grossly inadequate provision for depreciation, resulting in overstatement of income, followed by an excessive payment of dividends, frequently out of capital, has been another method whereby many an unfaithful or speculating management has siphoned out the assets of operating companies while your senior securities suffered. The records contain instance after instance of such confiscation of values.

Abuses brought investigation

SOME of the flagrant abuses in the industry have recently been revealed to the investing public through the instrumentality of federal agencies. These revelations have aroused general public condemnation. From certain quarters purporting to be independent, but actually associated with management groups, we are told that the industry's ills arise from the various activities of the federal government and of regulatory commissions. An honest, dispassionate analysis fails to sustain this charge. Where investigations of utility affairs disclose illegal and unsound practices the government has not hesitated in making such disclosures known to the consuming and investing public. Nothing less than this would discharge your government's duty to protect the investor. The preservation of investment values demands that corporate structures be soundly established, that abuses be revealed, and that physical and financial operations be correctly reported to the public.

The electric industry has grown at a rapid rate and is destined to continue to grow. Further growth will require fresh capital. Fresh capital will be forthcoming from the public only to the extent that it is convinced that the industry is managed in accordance with high standards. If the private utilities are unable or unwilling to clean the slate, they will find it very difficult to convince investors to risk further capital in this essential business. In the national government's attempt to curb holding company abuses, to assure honesty of accounting, to simplify corporate structures, and to achieve security in fact for investors, the government is working in the long-range interest of all. If the industry, or any of the groups which have an interest in it, oppose this constructive program, it may find itself in a position where it will be difficult to secure fresh capital for the expansion which lies ahead.

By 1933 the management of some of our major electric utilities had become a national scandal. It was inevitable that President Roosevelt and the Congress should squarely face this situation. It was inevitable that they should see that regulation alone was inadequate fully to protect either the consumer or the investor. It was plain to all that regulation needed strengthening and needed supplementing.

A yardstick was forced

NEITHER industry nor investors took effective action to meet this situation. The President and Congress, in setting up the Tennessee Valley Authority, were merely responding to an overwhelming public sentiment. The public, investors and consumers alike, demanded an experiment, on a broad scale, of public electric operation. This development was designed to serve as one means of seeking to prevent a continuation of financial and operating practices which had brought discredit on the entire industry, sound and unsound managements alike.

The authority is under duty to acquire a market for its power. It is authorized to compete with existing utilities, and for this purpose is expressly empowered to erect duplicate facilities. But no competing facilities have been constructed, and I am authorized to say that under its present board none will be constructed, until every reasonable alternative has been exhausted. The authority, in public and in private, has urged this same principle of reasonableness upon municipalities in its area.

To avoid duplication of facilities, to avoid territorial competition, to buy property at fair prices, are cardinal policies of the Tennessee Valley Authority. Our adherence to these policies should reassure you of the authority's determination to respect prudent investment in useful property.

Public policy and business policy point to the utility industry as a principal repository of the conservatively invested funds of the country. The industry has all the characteristics which should commend it to the conservative investor. It is public in its nature, even enjoying the power which only the sovereign state enjoys—the power of condemnation. It has stability. *In spite of the financial mayhem committed upon it, its earnings record through the depression is remarkable.* It furnishes an essential commodity. It enjoys almost complete protection against territorial competition. It is a matter of national importance that an industry so intimately related to the public welfare should be so operated as to make it a safe repository for the funds of great institutions, such as your mutual savings banks.

An inference of manipulation

There is no basis for the hysterical cries of those who see, or pretend to see, disaster ahead for the electric industry. Can it be that they are deliberately trying to depress the prices of sound senior securities, so that they can be bought in at hysteria prices? This may be a subject which would merit investigation by public agencies, and perhaps by senior security investors, such as the Association of Mutual Savings Banks.

We have been given a national power policy to execute in the Tennessee Valley. It is intended to serve as a demonstration and an experiment. It answers an overwhelming public demand, after a decade of experience injurious to both investors and consumers. Under this new policy prudent investment in useful property will not only be respected but protected. We believe that this limited operation of a public power system will set up a precedent of trusteeship in this business which will have a sound effect upon the financial policies of private utilities, and will work to the advantage of the institutional investor in this great industry.

Fair Play for 13,000,000

Savings Banks Apprehensive About Their Investments in Utility Bonds—Doubt Validity of Government Entering the Business

By EDWARD K. WOODWORTH
President New Hampshire Savings Bank

MOST of us here today to consider problems of savings bank management are apprehensive about our investments in electric utilities. Our investments in the mortgage bonds of operating companies vary so widely in their quality rating that there is danger in talking about them as a class or discussing them in general terms. Ownership of Brooklyn Edison 5s of '49, for example, presents no such problem as do the various issues of the Alabama Power Company. Nevertheless, we frequently ask ourselves and each other what is going to happen to our public utility investments as a class, and there are certain considerations which are applicable in varying degree over a field as wide as the industry itself.

For many years mortgage bonds of operating public utilities have been legal investments for mutual savings banks. Scores of such banks hold these bonds in amounts exceeded only by their real estate mortgages. The amount of such bonds held by mutual savings banks is more than $500,000,000. The real owners are the 13,000,000 depositors who look to us for intelligent action in safeguarding their investments. These millions, together with other millions who have sought protection through life insurance, or have invested directly in public utility securities, have furnished the money to develop these vitally important instrumentalities of service, comfort and convenience. It is an unhappy feature of the present situation that these every-day folk are so generally overlooked by those who for one reason or another find it desirable to attack what they are pleased to call the power trust. It has been said that the public utility investor is the forgotten man in the New Deal. It may become our duty to help in reminding the world of his existence.

We had every confidence in the spirit as well as the letter of our federal and state constitutions which provide that private property shall not be taken for public use without just compensation. The industry had been created and developed by private initiative and private capital. Government had not inspired Edison, Bell, Steinmetz, Pupin or the others who had given to mankind the blessings of their inventive genius, nor did government compensate them for their toil or make their discoveries of practical use in the homes of the people. Streams were harnessed, coal mines opened and generators and transmission lines built with private capital, in full confidence in the constitutional principle to which we have referred. In the upbuilding of this great and indispensable public service under private initiative and with private capital the savings banks and their depositors have played an important part. No fair-minded person can question our action in investing a substantial part of our depositors' money in this field.

Apprehension now exists

NOW the picture seems to have changed. Although few such bonds are in default, we are conscious of apprehension. What has happened? Without attempting to name them all or to define their relative importance, we may list, among the causes, disclosures of abuse of power and misconduct by a few men in high places in the industry; a resulting resentment which has shown itself in demands for lower rates, higher taxes and municipal ownership; assaults for political purposes by those who believe they never lose votes by attacking the local utility company and, finally, the activities of the federal government in the Tennessee Valley and elsewhere involving the expenditure of vast sums of money in power developments in territories already oversupplied with generating capacity.

With a stake of $500,000,000 in utility bonds and the funds of 13,000,000 thrifty people in their keeping, savings banks grow apprehensive of federal pressure on the power companies. President Woodworth, with this in mind, last week told the National Association of Mutual Savings Banks just what he feared. It is a direct challenge to the contentions of David Lilienthal of T.V.A.

As to abuses of power and misconduct, this association should be the last to condone financial chicanery or political corruption. It should be the first to condemn them. We should, however, exercise sound judgment and remind ourselves and others that the great majority of utility managers are quite as honest as ourselves and that it is never wise to burn the barn to get rid of the rats. We should remember the honest efforts and the honest dollars which have wrought the great structures which are our modern and admirable public utility systems. Abuses of power and misconduct of one kind and another have doubtless resulted in some instances in overcapitalization, including excessive issues of bonds. As bank managers we must seek out such instances, do our best to minimize our losses and wring whatever blessing we can from our experience.

We should combat the idea that public ownership is the universal panacea, and remember that where great systems have been built up to serve numbers of communities the invasion of the field by a municipality here and another there is bound to weaken the value of what is left to private control, and, usually, without any offsetting public benefit. There is little in the record of the management of municipal affairs to indicate that town and city fathers would be less corrupt or more efficient than the managers of privately owned companies.

Perhaps, as owners of bonds, we do not need yet to worry much about the tax burden. It is, however, a matter of no small consequence when between twelve and twenty cents of every dollar of public utility revenues is paid out in taxes. The loss of this revenue to public treasuries should receive serious consideration in connection with the relative advantages of public and private ownership, nor should it be overlooked in contrasting rates.

Effects of low rates

IN CONNECTION with a demand for lower rates, in recent months a highly disturbing factor has been the announcement by federal agencies of domestic rates greatly below the charges which even the most enlightened of private managements have believed necessary to meet operating expenses, taxes and provide adequate reserved for depreciation and obsolescence, and a fair return on the investment.

The idea has been planted in the public mind that these low rates are intended to provide a yardstick for determining the fairness of domestic rates everywhere. Whether this inference is justified or whether those responsible intended that it be drawn is beside the point. We are merely pointing out its existence and calling attention to the importance of its bearing upon investments in public utilities.

Another feature of the changed picture is the duplication of existing facilities. Those who have never bought bonds of less high rating than Philadelphia Electric 1st 4s of '66 may not share the anxieties of those of us who have loaned our depositors' money to build power houses and transmission lines in Tennessee, Georgia, Alabama, Oregon, Washington and elsewhere throughout the land, but when the federal government indicates its purpose to spend or loan public funds to duplicate or reduce the field of operations of properties in which millions of dollars have been honestly invested and from which millions of people have derived the benefits of light, heat and power, even the holders of only triple A bonds may well join their less fortunate brethren in considering what should be done about it.

The spectacle of the great state of New York authorizing municipal ownership, without first requiring the purchase of existing facilities at a fair valuation, is far from reassuring even to the most conservative of investors.

When the city of Knoxville goes municipal, under the spell of the Tennessee Valley Authority, we need not be amazed, but when the Public Works Authority offers to lend even an inadequate sum to a city whose indebtedness already has outrun its credit, to build a distribution system where one quite adequate already exists, we must at least sit up and take notice. The subsequent negotiations for the purchase of the Knoxville properties by the T.V.A., whatever the outcome, should not cause us to forget that the director of the P.W.A. has been unmoved by protests against the use of public funds for the duplication of existing facilities. Secretary Ickes has said: "If municipalities make surveys and want to build their own plants, it is not our business whether they have made up their minds wisely or not. They come here with their plans. We look at them and if they are all right we will let them have the money." Such an attitude is hardly reassuring.

Is the T.V.A. a fair yardstick?

IT MAY not be the business of our national association to question the wisdom of the purpose behind this tremendous Tennessee project, which is stated to be "the economic and social development of a great region under the guidance of the federal government." It involves many far-reaching plans aside from the development of electric power upon a gigantic scale. It is our business, however—indeed, it is our solemn duty—to try to understand and estimate as accurately as we can the effect upon the future of privately owned utilities of the invasion of the field upon a scale so great as to be only possible when backed by the power and resources of the federal government.

There are definite reasons why it is difficult to feel convinced that the T.V.A. is providing a fair standard of costs of construction and operation for the production and distribution of electric light and power, or that a domestic rate starting at 3 cents a kilowatt-hour and going down to 4 mills is a fair "yardstick" of general application. It may be that the T.V.A. will succeed in its efforts to set an example of how public utilities can be built on a huge scale with government resources in 1934 and operated on a fair competitive basis, with all charges, including interest and the equivalent of taxes, covered by rates which seem startlingly low. It may be that the privately owned utilities will be taught much and that their customers will benefit greatly as to both cost and service. It may be that all this and more can and will be accomplished without injustice to those who made their investments in good faith when the art was less fully developed, when costs were higher, and surely when faith in the principles of regulated monopoly and safety from confiscation seemed well founded.

At the moment, however, we are painfully aware of the depreciation in the market value of various bonds in our portfolios. Bonds of companies within the sphere

of influence of the T.V.A. are but conspicuous examples of many issues in which we have invested the money of our depositors. To some of us it seems contrary to what we have been brought up to believe are sound American principles for the federal government to invade the utility field, at least without making adequate provision for all damage suffered by those who have invested their money in good faith in properties which have been reasonably well managed. It would seem that an offer to pay only for what is actually taken, without similar payment for the damage caused by severance of part of the property to that which remains in private hands, falls short of just compensation. The principles governing the taking of property by eminent domain should apply. Otherwise our faith in any sort of investment will be seriously shaken. Without the assurance of fair play, the industry will find it difficult, if not impossible, to raise the capital for the necessary expansion of facilities if we are to achieve "the larger and better use of electric power by the whole people," for which the chairman of the T.V.A. has expressed the hope in his recent report to President Roosevelt.

It is probably safe to say that almost any company can afford to sell current to domestic customers, in addition to the current they are already using, at low rates. It is equally true, as a general statement, that most operating companies need and are entitled to approximately their present net incomes. Managements therefore are under obligation to collect substantially all the revenue they are now receiving.

The problem is to find the way to continue to receive the necessary return but from a much larger volume of sales at lower average rates. We believe that this must be a relatively slow development and must proceed on a sound basis.

We think this should be recognized publicly by those responsible for so-called "yardsticks," especially if they are based upon developments which will take a long time and upon a customer use eventually to be expected but which has not yet been realized. Future hopes should not be set up as present standards when private capital, especially trust funds, is taking all the risk.

It will be necessary for us as savings bankers to try to understand the broader outlines of the technical, economic and political conditions surrounding the industry. We must know what is going on and, if necessary, inform our depositors. The troublesome problems, of course, are not all present in all companies to the same degree. We shall want to know how the companies in which we have invested in the past and may invest in the future deal with the many problems with which they are confronted. Especially we shall be interested in how they meet questions of political and public relations; how alert they are in developing market expansion; whether their financial and accounting policies are sound, and whether they are making adequate provision for depreciation and obsolescence.

It is suggested that a public utilities committee be set up in this association on a permanent basis and be authorized and instructed to make every reasonable effort to protect our investments in the much-berated, but still vitally essential, public utilities in which hundreds of millions of our depositors' money is invested.

Three-Light Lamps Fit Varied Church Needs

By J. J. TYNAN
Lighting Engineer Atlantic City Electric Company

An innovation in church lighting was recently carried out in Pitman, N. J., when three-light, two-filament "Mazda" lamps were used to light indirectly the renovated First Baptist Church. This application permits shadowless illumination at three levels to fit different church occasions. The main auditorium measures 43 x 27 ft., with a ceiling height of 15 ft., and is lighted by eight indirect Guth super-illuminators. The 150/200-watt two-filament lamps are employed in this part of the church. The walls and ceiling are of plaster with rough sanded finish; the ceiling is painted grayish white and the side walls light cream color.

The lighting level in the main auditorium measured at a horizontal plane 3½ ft. from the floor averaged 4.2 foot-candles, with the 150-watt filaments in use at 116 volts; 6.0 foot-candles with the 200-watt filaments in use at 115 volts and 10.5 foot-candles with both filaments in use at 113 volts. In the Sunday school section two of the larger Guth indirect illuminators with the 200/300-watt lamps are used and they produce 3 foot-candles, 5 foot-candles and 6.1 foot-candles, respectively, at 113 volts.

Three-light lamps give this church three level shadowless illumination

When Use Is Measured by Comparable Unit Values

An Analysis Which Shows Customer-Use Factors for Electrical Energy by Geographical Regions and Classes of Consumers

THE use of averages as yardsticks of light and power accomplishments may lead to wrong conclusions. Classifications of customers are not uniform; some properties are metropolitan, with a large amount of underground; others are widely extended transmission systems; in other instances the purchasing power of the people differs greatly, as well as their habits and occupations.

These facts are very evident in the accompanying study of unit values taken from the U. S. Census of 1927 and 1932. An understanding of these facts is necessary to a proper interpretation of the data on commercial or privately owned utilities and on municipally owned utilities, as well as the data pertaining to the several regions. But if these modifying facts are taken into account, the unit data are interesting. They show changes from 1927 to 1932 and they show the wide variations that exist whereby the use of any average value for the cost of distribution or for rates is vague and almost meaningless.

For example, in farm service the Pacific Coast has a very high usage and much of this is accounted for by the pumping for irrigation that prevails in California. Another example is the use per customer of wholesale service in the South. This high use is accounted for by a concentration of industry in a relatively few large plants and the absence of a multitude of small plants found in a more concentrated and diversified industrial area.

Averages are the most dangerous of all statistical tools when improperly used. Too often they involve the comparison of elements not truly comparable. Many studies of power companies versus municipal operations have come to grief for that very reason. This article, based on official U.S. Bureau of the Census figures, offers data on region and use—similar terms. A fundamental base for further studies by individual properties.

Some interesting observations may be made as to use, rate value and revenue per customer. But conclusions cannot be drawn hastily. On the Pacific Coast, for example, in domestic service the use is large, the rate

Table I—Unit Values for Classes of Service and Regions for All Utilities

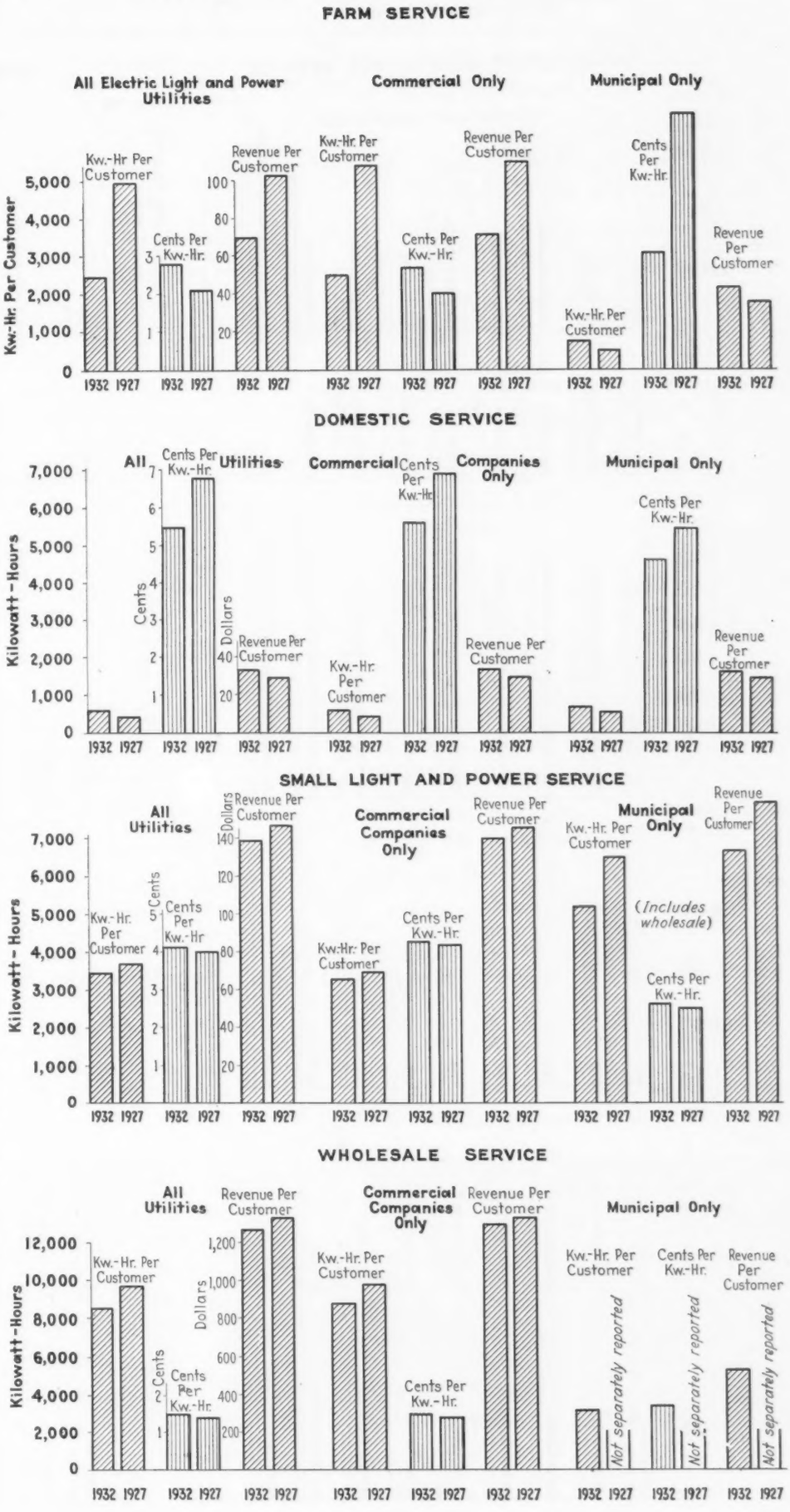
	New England		Middle Atlantic		E. N. Central		W. N. Central		South Atlantic		E. S. Central		W. S. Central		Mountain States		Pacific States	
	1932	1927	1932	1927	1932	1927	1932	1927	1932	1927	1932	1927	1932	1927	1932	1927	1932	1927
Farm Service....																		
Kw.-hr*.....	663	425	754	544	728	465	797	605	932	465	849	224	2,421	5,531	2,279	2,872	9,349	14,024
Rate,† ave.....	6.3	7.3	6.4	8.0	6.5	8.0	8.3	8.1	5.5	8.3	6.5	9.8	4.0	2.8	2.9	3.5	1.6	1.6
Dollars*.....	42	31	48	43	47	37	66	49	51	38	55	22	96	152	66	100	148	227
Domestic Service																		
Kw.-hr.*.....	552	379	542	431	620	461	598	396	688	472	589	373	553	388	687	484	805	580
Rate†.....	6.1	8.0	6.3	7.4	5.2	6.2	5.6	7.3	5.5	7.0	6.0	7.9	6.5	8.3	5.3	6.2	3.8	4.4
Dollars*.....	34	30	34	32	32	29	34	29	38	33	36	30	36	32	37	30	30	26
Small Light and Power Service																		
Kw.-hr.*.....	2,346	2,536	2,498	2,977	3,454	3,761	3,255	2,997	3,795	4,049	2,712	2,711	3,014	2,174	3,152	5,364	7,157	7,864
Rate†.....	5.4	5.0	5.3	4.7	4.1	4.1	4.2	4.6	4.0	4.1	4.7	4.8	4.5	5.8	4.8	3.3	2.2	2.3
Dollars*.....	128	128	133	141	142	153	137	138	152	167	127	130	135	126	151	179	158	178
WholesaleService																		
Kw.-hr*.....	53,963	50,700	80,986	214,305	126 256	124,298	44,761	28,433	269,152	117,850	167,379	121,003	64,577	45,809	75,935	572,844	49,657	56,317
Rate†.....	1.8	1.7	1.6	1.2	1.6	1.6	1.5	1.8	1.3	1.2	1.1	1.3	1.6	1.9	1.3	0.8	1.1	1.2
Dollars*.....	943	868	1,311	2,526	2 004	2,000	679	507	3,576	1,471	1,823	1,568	1,008	862	1,002	4,396	569	654
Street Lighting Service																		
Kw.-hr*.....	125,726	121,949	84,455	91,311	100,097	104,724	50,048	49,516	44,585	68,734	62,227	70,571	30,259	50,571	66,076	71,165	139,226	56,847
Rate†.....	5.3	5.5	5.4	5.6	3.0	3.3	4.0	4.6	4.8	5.2	4.3	4.3	3.0	3.6	4.2	4.6	3.1	3.6
Dollars*.....	6,644	6,768	4,581	5,117	2,998	3,496	1,995	2,263	2,137	3,576	2,687	3,050	912	1,844	2,743	3,294	4,341	2,052

*Per Customer. †Per Kilowatt-hour.

low and yet the revenue per customer is relatively small. The influence of inexpensive water power, the absence of competing services and other factors must be considered in studying these data in comparison with data from other sections. In wholesale service, for example, the South ranks very high in use and in revenue, also, yet has a low rate.

Other interesting observations may be made with respect to gains made from 1927 to 1932 in the several classes of service in the several regions. In general, the progress in the South is notable. But here again the fact must be considered that this section was very active in development in this relatively short Census period. Other regions developed at other periods just as rapidly. Also, in studying these data, the fact that 1932 was the depth of the depression must be considered and the data are not normal. It would be fairer as a yardstick to compare 1927 and 1934.

The graphical presentation of data on all light and power utilities, on privately owned or commercial only and on municipally owned only are also interesting if studied with a knowledge of modifying elements that lie behind the data. It is evident that the municipal and commercial methods of classifying customers differ greatly so that direct comparisons are invalid. This fact is more evident if regional unit comparisons are made. Municipal utilities largely consist of large or small town units serving restricted areas and concentrated loads. Private utilities are more generally regional in service and carry many customers in their territory, so that both invest-



Four Classes of Service Compared—1932 and 1927

Sharply decreased domestic rates during the five-year period brought only a moderate rise in revenue per customer. Inclusion of wholesale with retail commercial sales by municipalities vitiates comparisons in those classes. Changes in classification probably account for peculiar changes indicated in farm use.

Unit Values by Regions · · · 1932, 1927

Changes in Use, Rate and Revenue per Customer

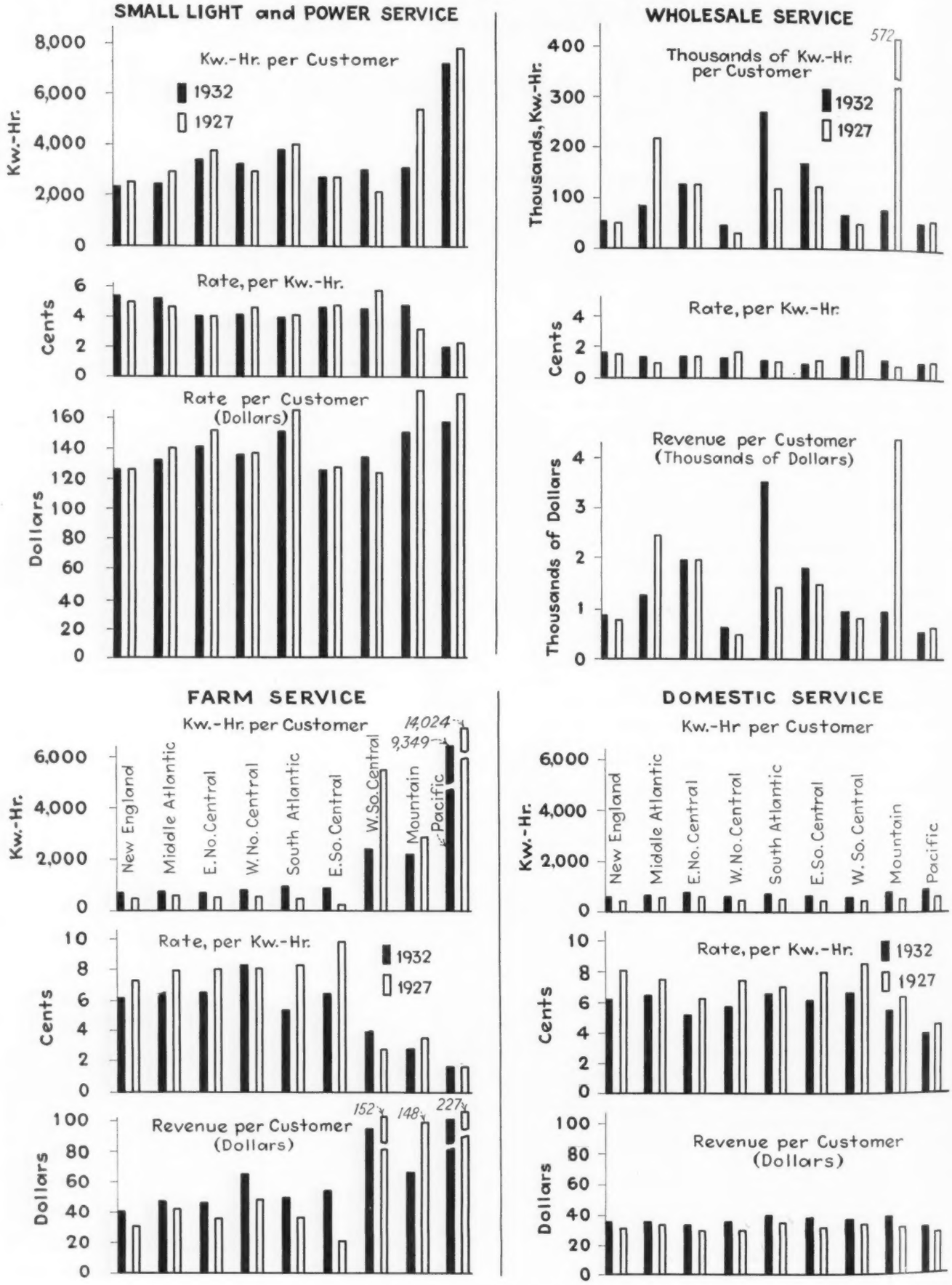


Table II—Results of Supplying Customer Classes in 1927 and 1932

	1932			1927			Unit Values					
	All Utilities	Commercial Only	Municipal Only	All Utilities	Commercial Only	Municipal Only	All Utilities		Commercial Only		Municipal Only	
							1932	1927	1932	1927	1932	1927
Farm Service												
No. of customers.....	613,753	592,692	21,061	168,450	152,384	16,066	2,451	4,959	2,511	5,426	767	525
Kw.-hr. sold.....	1,504,257,106	1,488,105,684	16,151,422	835,271,354	826,831,462	8,439,892	2.8	2.1	2.7	2.0	3.1	6.8
Revenue.....	$42,773,826	41,874,996	898,830	17,282,957	16,708,121	574,836	$70.0	103	71.0	110	43	36
Domestic Service.												
No. of customers.....	19,285,560	17,337,876	1,947,684	16,039,066	14,595,774	1,443,292	611	443	600	430	708	577
Kw.-hr. sold.....	11,790,139,511	10,410,749,374	1,379,390,137	7,105,619,723	6,273,316,235	832,303,488	5.5	6.8	5.6	6.9	4.7	5.5
Revenue.....	$649,764,750	584,995,286	64,769,464	481,509,354	435,537,969	45,971,385	$34	30	34	30	33	30
Small Light and Power												
No. of customers.....	3,527,794	3,284,326	243,468	2,784,126	2,569,911	214,215*	3,418	3,684	3,286	3,464	5,199	6,329*
Kw.-hr. sold.....	12,059,463,977	10,793,767,814	1,265,696,163	10,257,240,582	8,901,389,129	1,355,851,453*	4.1	4.0	4.3	4.2	2.6	2.5*
Revenue.....	$491,852,492	459,440,913	32,411,579	410,652,535	376,550,255	34,102,280*	$139	147	140	146	133	159*
Wholesale Light and Power												
No. of customers.....	379,402	365,038	14,364	342,256	1,970,509	.....	85,345	97,797	87,474	97,797	31,249	.....
Kw.-hr. sold.....	32,380,076,220	31,931,212,851	448,863,369	33,471,610,198	33,471,610,198	.....	1.5	1.4	1.5	1.4	1.7	.....
Revenue.....	$483,390,649	475,738,880	7,651,769	456,472,907	456,472,907	.....	$1.274	1,334	1,303	1,334	532	.....
Street Lighting												
No. of customers.....	29,832	28,977	835	22,232	21,251	981	74,942	78,330	60,223	60,617	586,084	462,041
Kw.-hr. sold.....	2,235,668,364	1,746,288,517	489,379,847	1,741,423,872	1,288,162,128	453,261,744	4.1	4.4	4.7	5.1	2.1	2.4
Revenue.....	$92,010,645	81,795,213	10,215,432	77,198,896	66,141,258	.....	$3.084	3,472	2,821	3,112	12,334	11,272

*Includes wholesale.

ment unit values and rate unit values must take these different service conditions into consideration. Even the data for 1927 and 1932 are not comparable in several instances because of changes in customer classifications. The data are interesting, however, and have significance when interpreted correctly.

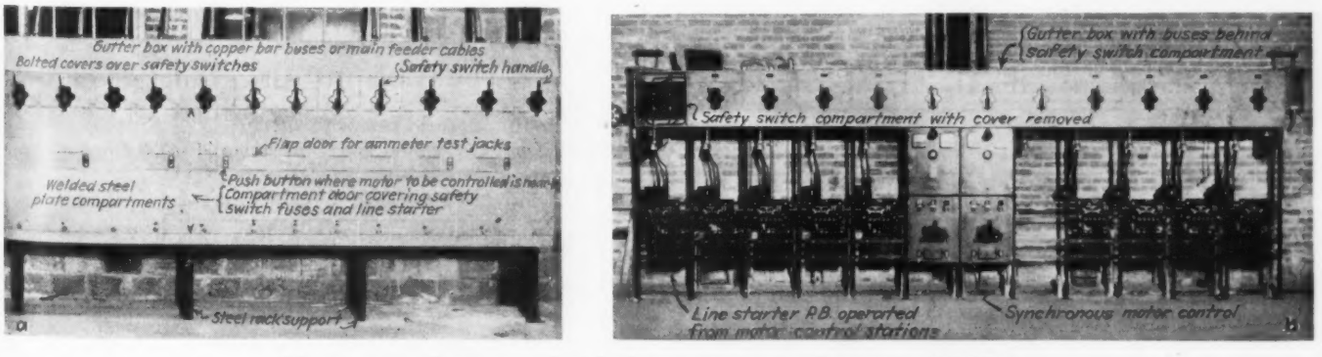
Load-Center Distribution Makes Paper Mill Modern

By A. P. SCHNYDER

Electrical Engineer with George F. Hardy, Consulting Engineer, New York

Mill electricians have plenty to do to look after many dozens of motors and their controls as well as maintain lights and attend to voltage regulators without being pestered with the weaknesses of archaic distribution systems. Simplicity in layout has the added advantages of localizing troubles and of centralizing the control from the operating standpoint. In some recent mills all motors are served directly from motor group control centers, which in turn are fed by radial feeders from the main switchboard in the turbine room or substation. In one such mill old fused power distribution panels were replaced with fused safety switches and push-button controlled starters in conventional rack arrangement. At another mill factory-assembled metal-clad cubicles were installed, reducing erection time and improving the protection and appearance.

The push-button control is always located at the motor except where the motor is within unobstructed view from the group center, in which case the push buttons are set in the starter housing. Often it is desirable to provide dual control for the convenience of the department foreman, as, for example, in several newsprint mills which have outdoor ground wood storage tanks receiving grinder output over the week-end mill shut-down periods. A set of pumps for stock circulation within the tank and for feeding back to the mill upon demand are housed alongside the tank. One push button at the pump motors, supplemented by a paralleled one inside the mill, makes it unnecessary for the operator to go outdoors in stormy and cold weather.


Gutter box with copper bar buses or main feeder cables
Bolted covers over safety switches
Safety switch handle
Flap door for ammeter test jacks
Welded steel plate compartments
Push button where motor to be controlled is near
Compartment door covering safety switch fuses and line starter
Steel rack support
a
Gutter box with buses behind
Safety switch compartment
Safety switch compartment with cover removed
Line starter P.B. operated from motor control stations
Synchronous motor control
b

Motor control centers placed close to groups of paper mill drives

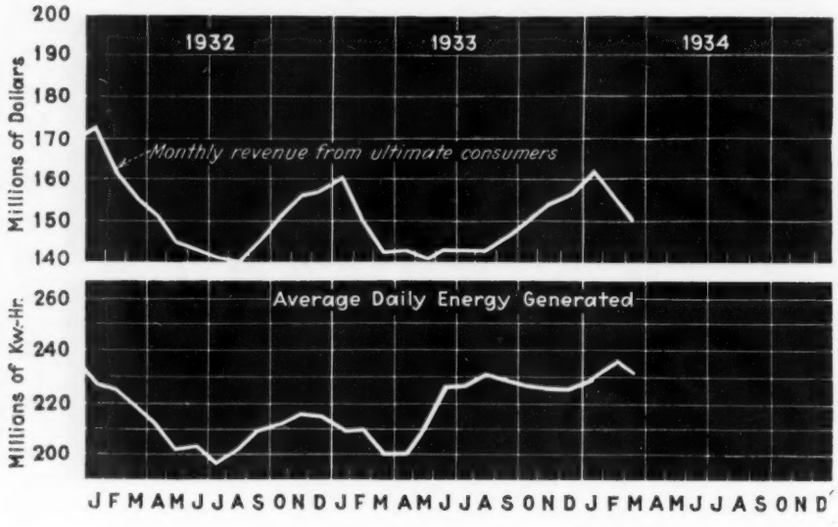
Line starters, gutter boxes along top of boards, all steel inclosure, dead-front panels feature (a) 550-volt and (b) 2,300-volt motor control centers in a modern paper mill

Utilities Increase Lead Over 1933

March revenue, 5 per cent over last year's, totals $149,780,400. Shrinkage from winter peak is smaller than usual. Output tops 1933 by 15.2 per cent; wholesale use gains 34 per cent.

ELECTRIC light and power operations seem to be definitely on the up-grade. Energy output during March, 7,211,275,000 kw.-hr., just missed setting a recovery record since the end of 1931 by rising approximately to the figure of last August. It surpassed the production a year ago by 15 per cent, compared with 10 per cent in January and 11.5 per cent in February. Revenue also is gradually stepping ahead of comparable figures in 1933. Aggregating $149,780,400, receipts from ultimate consumers exceeded those for the month in 1933 by 5.1 per cent.

The margin has been widening; in January it was 1.1 and in February 3.4 per cent. Prior to January the receipts had for some time been running under those of the preceding year. The effects of these various changes combined to bring the total for the twelve-month period ended in March to $1,787,563,300, which is almost identical with the total for the like period preceding it. The earlier unfavorable difference was balanced by the later gains.



More wholesale energy

A year ago energy production was almost at its lowest since 1930. The decrease in consumption by wholesale users was especially severe. The subsequent gain in this item has been correspondingly large. In March it amounted to 33.8 per cent compared with the same month of 1933, and therefore considerably exceeded the 26 per cent recorded in February. Domestic consumption also is moving up, and in March amounted to 1,056,000,000 kw.-hr., thereby setting the highest figure for that month thus far attained in the history of the industry. In accordance with the usual decline at this season it fell short of domestic consumption in February, but the rate of increase, 5.2 per cent over the preceding year, was the best in several years. Retail commercial sales, though down from February because of lengthening daylight, gained 6.3 per cent over 1933.

The revenue figures here given refer to receipts from ultimate consumers only, and do not include payments for energy purchased by one utility from another, for resale. The probable magnitude of the difference was discussed in the ELECTRICAL WORLD of April 28, 1934, on page 628.

Table I—Monthly Revenue from Ultimate Consumers and Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1934	Revenue from Ultimate Consumers		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.
March	149,780	+5.1	7,211	+15.2	2,898	+ 0.8	4,313	+27.3
February	154,832	+3.4	6,754	+11.5	2,138	—15.7	4,436	+31.8
January	162,070	+1.1	7,174	+10.0	2,820	— 0.3	4,354	+17.4
1933								
December	156,127	— 0.9	6,989	+ 5.0	2,560	0	4,429	+ 8.3

Table II—Regional Revenue, Energy Output, in March, 1934

Compared with Corresponding Month of Previous Year

Geographical Region	Revenue from Ult. Consumers		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.
United States	149,780	+5.1	7,211	+15.2	2,898	+ 0.8	4,313	+27.3
New England	13,236	+6.1	509	+26.0	260	+14.0	249	+41.5
Middle Atlantic	44,929	+3.1	1,849	+14.8	602	+ 9.3	1,247	+17.6
East No. Central	34,744	+7.9	1,773	+27.3	151	—22.0	1,622	+35.1
West No. Central	13,093	+6.3	437	+ 4.7	101	—34.7	336	+24.0
South Atlantic	18,295	+4.6	915	+12.2	568	— 2.6	347	+50.3
East So. Central			292	+11.0	242	+ 6.7	50	+36.8
West So. Central	7,835	+4.5	323	+ 8.7	9	—57.0	314	+14.0
Mountain	4,178	+3.9	221	+15.5	176	+22.2	45	— 5.2
Pacific	13,470	+4.5	892	+ 7.7	789	+ 4.2	103	+43.5

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central station.

Table III—Allocation of Energy, March, 1934

Compared with Corresponding Month of Previous Year

Class of Service	Millions of Kw.-Hr.	Per Cent Inc.
Total for distribution*	7,198	+16.4
Lost in transmission, etc.	1,402	+ 7.5
Sold to ultimate consumers	5,796	+18.8
Domestic	1,056	+ 5.2
Com'l, small light and power	1,046	+ 6.3
Com'l, large light and power	2,971	+33.8
Municipal street lighting	191	— 2.4
Railways—street and interurban	413	+14.4
Railroads—electrified steam	66	+21.1
Municipal and miscellaneous	53	— 6.6

*Generated, purchased from other sources and imported less energy used in railway and other departments.

New 7-ft. steel pipe on saddles alongside 12-ft. wood-stave pipe

Removal of the buried pipe and of the concrete retaining wall which held its backfill had to be done carefully because of the proximity of the newer wood-stave pipe. The sections of the new 7-ft. steel pipe were transported up-stream on a track laid temporarily on the previously completed sills for the saddles.

Should an Old Hydro Be Rebuilt?

Cold, Hard Facts of Water Power Modernization as One Utility Found Them

By W. B. CARR

Hydraulic Engineer Buffalo, Niagara & Eastern Power Corporation

TWO sections of the hydro plant of the Utica Gas & Electric Company at Trenton Falls, N. Y., were put up in 1900 and 1918 respectively. They have been turning out about 130,000,000 kw.-hr. per year, but leakage in some half-mile of 7-ft. wood-stave untreated Texas pine pipe, buried since 1900, had rapidly become excessive. It was believed that this leakage, along with the leakage through the 60-in. gate valves in the older section of the plant, was entailing a loss of at least 3,000,000 kw.-hr. per year. The solution which was adopted—a new 7-ft. steel pipe—actually added nearly 7,000,000 kw.-hr. and raised the capacity from 26,286 to 27,510 kw., a gain of nearly 5 per cent. At the same time improvements at the intake and cross-connection of the 7-ft. pipe with the 12-ft. pipe of the newer station gained a head of 2.5 per cent of the total head.

After 30 years the dam itself (60 ft. high on sound limestone) is still in satisfactory preservation. The plant, built at the same time, consists of four 1,000-kw. rated capacity vertical units. They are Fourneyron outward flow units connected to a common distributor fed by the 7-ft. steel plate pipe line, which joins the wood-stave line about 1,100 ft. from the power house. Each turbine has a 60-in. hydraulically operated gate valve. At the pond the wood pipe line is connected to two 60-in. inlet pipes through the dam with 60-in. gate valves operated by belted gearing. The turbines have cylinder gates operated by hydraulic pressure governor. Runner and gate are of bronze, so that, although largely obsolete in form, welding and restoration of worn surfaces was readily possible.

Conservative designing of the 1900 period gave the generators a margin of 20 per cent capacity, which they are capable of handling continuously. This afforded the opportunity to raise the head and output of the wheels if this proved feasible upon analysis. Inspection showed that the gate valves were leaking badly and apparently needed reseating. The water loss was excessive because these units were idle about 80 per cent of the time, operating only on peak load or during floodwater periods.

Serving these units was the 7-ft. pipe line of $2\frac{3}{8}$-in. Texas pine staves bound with bands of $\frac{5}{8}$ or $\frac{3}{4}$-in. iron. This buried pipe was known to be in very poor condition and could no longer be maintained at reasonable expense.

In 1918 the new section of the plant was built, consisting of three 8,000-kva. vertical hydro units with direct-connected exciters. They are each connected by 7-ft. penstocks approximately 147 ft. long to the lower end of a 12-ft. diameter steel pipe which, including the distributor section, is 694 ft. long. In this instance the 12-ft. wood-stave section (2,669 ft. long) joining the intake to the steel pipe is supported on concrete saddles and entirely exposed and accessible for maintenance. At the intake end it connects to a header with six 60-in. intake pipes and a $10\frac{1}{2}$-ft. auxiliary tunnel inlet. Only two of these 60-in. inlet pipes had been in service because the four others lacked trash racks. Two of these four were provided with by-passes and valves to facilitate draining the pond. This whole system of units, pipe and valves is in good condition and requires only ordinary maintenance.

Loss of head and leakage tests were made in 1931 and it was found that the 7-ft. buried wood-stave pipe and the four 60-in. gate valves in the old plant were leaking at the rate of 22.4 c.f.s. The loss of head through the two intakes now feeding the 12-ft. exposed wood-stave pipe was found to be high and so were the friction losses in the 12-ft. pipe. Analysis of the data indicated

There are many old hydro plants which, if rehabilitated, could turn out more kilowatt-hours. Are they worth the outlay? They were in this case. The added firm capacity was obtained at two-thirds the cost of the existing capacity. With coal costs soaring, many properties with obsolete hydro stations will find such facts as these to be highly significant.

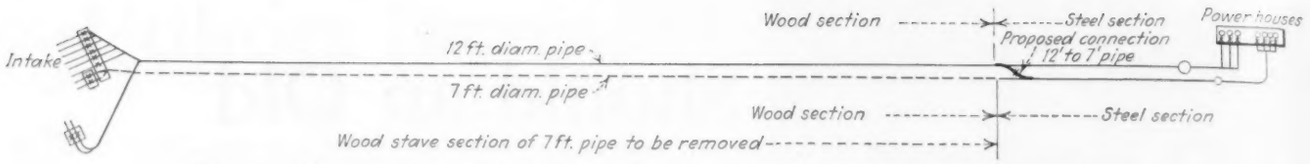


Fig. 1—Abandonment of buried wood-stave pipe not most economical procedure

Serving both groups of turbines from larger and newer pipe not as desirable as replacing the deteriorated wood-stave line by a new pipe.

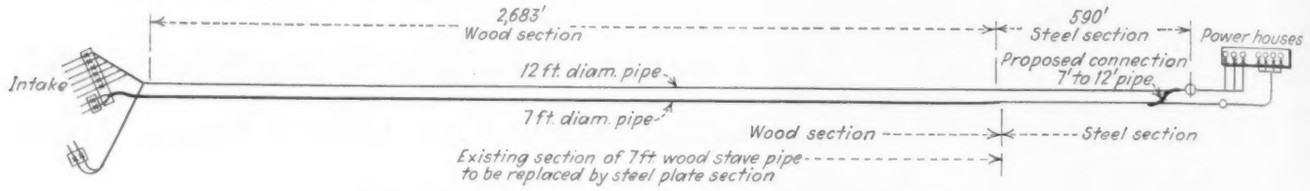


Fig. 2—New steel pipe replaces leaky wood-stave line

Cross-connection of the two pipe lines reduces friction loss when newer station alone is operating.

that at a draft of 1,275 c.f.s. through the intakes a saving of 0.8-ft. head could be effected by placing the four idle intakes in service. This required only the installation of suitable racks.

In approaching the solution of the rehabilitation problem it was recognized that there were three plausible alternatives:

I—Abandon the old plant entirely and remove the deteriorated 7-ft. wood-stave pipe for safety considerations.

II—Abandon and remove the 7-ft. wood-stave pipe, connecting its 7-ft. steel pipe section to the newer 12-ft. pipe, thus operating the old and new stations on the 12-ft. wood-stave pipe (see Fig. 1).

III—Replace the 7-ft. wood-stave pipe with a new steel pipe and install a cross-connection between the 7-ft. and 12-ft. pipes just above the surge tank location. This would permit operating the new station on both pipes, conserving considerable loss in head (see Fig. 2). In common with (2) were the improvements at the intake in the form of individually operated and remotely controlled intake gate hoists in place of the mechanical belt-driven devices, installation of new intake racks and placing in service the four existing intake pipes not heretofore used. It was also contemplated to repair the hydraulic equipment in the old station to reduce leakage while idle and improve the operating efficiency.

Analysis of these alternatives showed (see table) that the greatest gain would ensue from adopting the third scheme of rehabilitation. It would increase the station capacities by 1,304 kw. (5 per cent), of which 410 kw. would be firm capacity throughout the year and 755 kw. is firm capacity available for about 80 per cent of the time. This gain in capacity would be secured at a total cost per kilowatt of only about 66 per cent of that entailed by the existing capacity. The total energy output would be increased by 6,963,000 kw.-hr., or 5.1 per cent. Assigning a reasonable value to the increase in all-year firm capacity, the energy gain would be secured at a cost of about half that of increment steam energy.

Abandonment of the old plant (proposition I) would have reduced the existing combined capacity of the two stations by 4,836 kw., or 18.4 per cent, and would likewise have reduced the total energy output by 2,840,000 kw.-hr., or 2.1 per cent. The estimated cost of retirement covering the removal of the 7-ft. wood-stave pipe amounted to about 11 per cent of the cost of proposition III; in addition, a book retirement of upward of 20 per cent of the investment in the old plant would have been necessary.

The second proposition would have decreased the existing combined capacity of the two stations by 223 kw., or 0.85 per cent, and would have increased the total energy output by 3,123,000 kw.-hr., or 2.3 per cent. The estimated construction and maintenance cost was about 48 per cent of that of proposition III and, in addition, there would have been required a book retirement of about 3 per cent of the cost of the old plant.

Revamped Hydro Installation Adds to Capacity and Output

	Existing Plant	Three Alternatives for Rehabilitation I Abandon Old Plant	II Use Only 12-Ft. Pipe	III Install New 7-Ft. Pipe
Combined capacity (kw.)				
Old plant	4,836	.....	5,406	5,730*
New plant	21,370	21,370	20,577	21,780†
Total	26,206	21,370	25,983	27,510
Energy output (kw.-hr.)				
Old plant	5,840,000	.....	6,606,000	7,017,000
New plant	129,000,000	132,000,000	131,357,000	134,786,000
Leakage	3,000,000	.....	.....	.....
Net output	134,840,000	132,000,000	137,963,000	141,803,000

* 894 kw. increase in capacity due largely to rehabilitation of turbines by welding runners, reducing runner leakage, etc.

† 410 kw. increase in capacity gained as follows:

(a) Approximately 350 kw. on account of crossover valve (see Fig. 2).

(b) Approximately 60 kw. on account of using additional intakes.

NOTE—At times of operating new plant only, capacity under proposition III is 22,255 kw. and a gain of 755 kw. is due to crossover valve and 130 kw. to additional intakes.

Operation wholly satisfactory

On this basis the logical solution was manifestly proposition III and this work was authorized. A new 7-ft. diameter welded steel pipe was furnished by Farrar & Trefts of Buffalo and the motor-operated intake gate hoists were furnished by the Limitorque Corporation of Williamstown, Mass. The work was carried out in the summer of 1931 at substantially the estimated costs, and the then current prices for materials and labor resulted in the economies indicated. Operating experience with the two pipe lines in parallel has been very satisfactory.

It is interesting to note that a life of practically 30 years was realized by the wood-stave pipe line of untreated Texas pine, which was completely buried throughout its entire length.

Mechanical Tap and Splice Experience

What One Association of Utility Engineers Found When It Investigated Overhead-Line Connector Service Values

By
C. C. CORNELIUS
Kansas City
Power & Light Company
Kansas City, Mo.

Solder pots and ladles as tools in overhead-line construction are being supplanted by mechanical connectors. For some purposes the newer method is not devoid of shortcomings. The conclusions reached in this engineering study by a Midwest group should clarify the situation for construction and operating engineers in overhead-line work.

FROM an inquiry among operating companies in the Missouri Valley Electric Association as to their use of mechanical clamps on overhead lines it appears that these devices in their various available forms and for their specific uses are meeting with a considerable and growing acceptance. From records of experience and of tests gathered in connection with this inquiry* the following general conclusions are derived as representing performance and as indicating the present stage of development of mechanical connecting devices:

1. Troubles from loose contacts may be expected due to the ductility of the metal, or the plastic flow of the metal, if the design of the clamp is such that the metal is stressed too greatly. This is especially true of bronze, copper and the non-ferrous alloys. Probably the limiting stress should be well below 50 per cent of the ultimate strength of the material. Research work is needed.

2. Conductivity of mechancial splices and taps is no better and may be less than soldered splices, as a general rule; nevertheless, it is in most cases equal to the conductivity of the wire in the joint and sufficiently good for the application.

3. The strength of mechanical splices and taps is in general equal to or better than soldered splices even in those types of conductors which are not weakened by the annealing action of solder. The mechanical splice or tap has its main advantage over solder in those high-strength wires, such as hard-drawn copper, high-strength alloys and aluminum, which become annealed and weakened with the application of solder.

4. For straight line splicing the spring type connector and the rolled sleeve have not been as yet fully proved by field experience and they cannot be given a rating as compared to twisted sleeves. The compression and drawn splices are ideal but costly.

5. For line taps the side groove or parallel groove type of clamp seems to be rapidly losing popularity and is being replaced with the type of clamp that entirely incloses the conductor in a modified vise.

6. Mechanical splices and taps can be justified economically for use on those joints that may be disconnected frequently or on those joints made on higher voltage lines of the transmission class, which must be worked hot, and where soldering is not practical or is difficult. On low-voltage or primary lines where a joint may never be opened it is doubtful if mechanical splices can be justified, unless the type of wire is not adapted to the use of solder.

7. Considerable progress has been made in the last few years in the development of mechanical connectors and splicing devices. While all that is desired has not as yet been obtained, the manufacturers are alive to the problem and improvements are being made rapidly. The field for use of these devices is growing with the necessity for further economies in distribution practice and the use of higher strength conductors. The desire for more simple methods to reduce operation costs should give an impetus to further development along these lines.

One company reported six or seven years experience with the drawn type of sleeve for high-strength conductors No. 2 and larger, with entirely satisfactory results. The main disadvantage is the size and weight of the draw bench required for the operation. The experience of the Kansas City Power & Light Company with high-voltage clamps has been that some corrosion may be expected with both copper and aluminum clamps, and this fact is responsible for precaution adequately to seal the joints. To do this all hot line clamps are dipped in a preparation which consists of a crude petroleum jelly to which has been added or incorporated an appreciable amount of chromium. The chromium acts as an anti-oxidant on the metals where it is employed. The method of preventing oxidation and corrosion has had some background of experience. A checkup in the Kansas City company reveals a case where this material was used in the original assembly of the bus contacts in the battery room of a d.c. substation. After 23 years operation the contacts were not deteriorated by acid fumes. The remainder of the bus had been painted and protected with a coating of white lead.

In connection with clamps for hot line work the Kansas City experience has shown that with the ordinary parallel groove or side clamp connectors at least two bolts per conductor on each connector should be used not only to increase the clamping action but to prevent fa-

*From paper to Engineering Conference, Missouri Valley Electric Association.

tigue of the material in the bolts and to prevent the connector loosening, due to trouble from vibration. All clamps used for hot line work are provided with an ear to facilitate handling with hot line tools. Records of operation of 1,150 miles of 11-kv. and higher voltages show three hot line clamp failures in 1929, two in 1931, five in 1932 and two in 1933. Practically all of the hot line tap-off clamps used by the company have been of the side clamp or parallel groove type. Over the past two years approximately 150 of the spring type sleeves have been installed for trial. Twisted sleeves are used for splicing conductors and some use has been made of the twisted or moused splice, both on dead and live lines.

Practically all service connectors used by the company have been of the U-bolt type, made of a non-corrosive material with 15 per cent or less of zinc. The earlier style of connectors were composed of approximately 90 per cent of copper, but on account of troubles developing, consisting of stripped threads, etc., especially after the connector was used the second or third time, the newer designs, including the higher strength materials or hard-drawn copper, have been used. The practice of the company since 1928 has been to use service connectors on all transformer secondary taps to the bus on all wires up to No. 4/0 stranded conductor and on all hot wire service connections at the pole and also the service connection at the customer's entrance. Service connections at the customer's entrance are taped to prevent accidental contact or shocks to persons. The company started using the mechanical service connector in the fall of 1928, since which time approximately 275,000 have been installed. Another company reports the use of 216,600 since 1929.

Service connectors better than soldered splices

Very little trouble with service connectors was reported by the companies replying to the inquiry. While the Kansas City records have not been kept with great accuracy, it is safe to say that the percentage of troubles with service connectors is less than with soldered splices, and these troubles are reducing with the newer designed connectors. Records on loose lugs on transformers have been kept with more accuracy and are as follows:

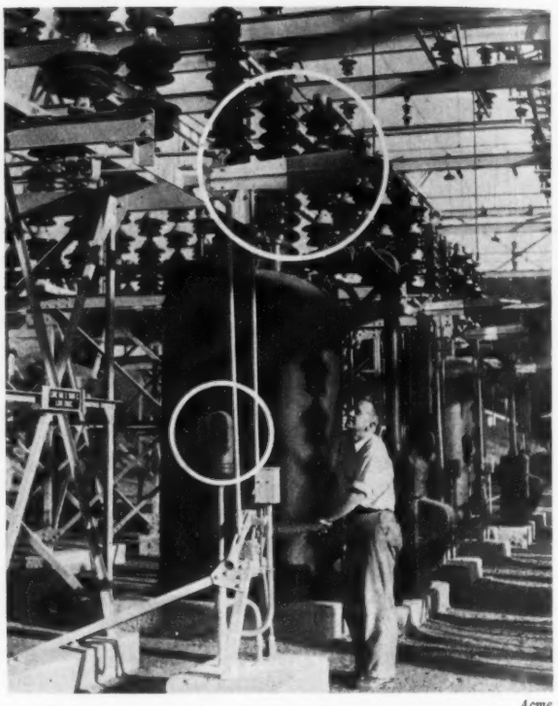
Year	Loose Trans. Bus Connections	Year	Loose Trans. Bus Connections
1928	20	1931	20
1929	34	1932	6
1930	25	1933	8

This record shows that troubles have been materially reduced by reducing the soldered connections and employing the mechanical connector.

Clamping devices for low-voltage secondary and service work have been adopted by the company largely on account of the ease of connecting and disconnecting services. Our records show that there has been something on the order of 4,000 connection and disconnections made per month for the past number of years. Approximately 2,500 of these connections and disconnections are made by troublemen. While the cost of the connector used in making this connection is slightly more than the cost of a soldered joint, it can readily be seen that the routing of a service gang to each of the 2,500 locations in a month's time would greatly exceed the additional cost of the mechanical connectors. The general result was that many connected or disconnected services remained unsoldered, which resulted in low voltage, flickering lights, radio complaints and ill will.

POWER COMPANY

Semaphore Signals on Breakers



Acme

Double protection for substation workmen

In the outdoor substation of the Moccasin Creek power plan of San Francisco's Hetch Hetchy power and water project semaphore indicators are used to indicate breaker operating status. Coupled with the breaker mechanism and with local lights, they indicate to operators in the yard the open or closed position of each oil circuit breaker unit.

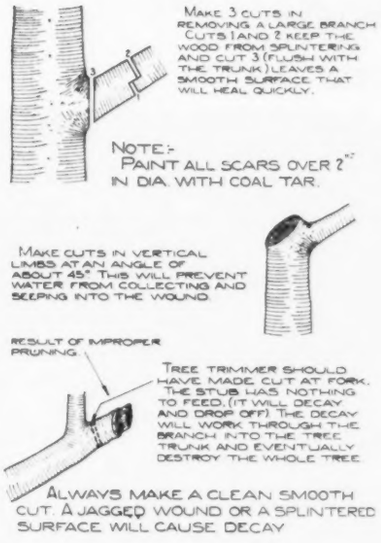
Careful Tree Trimming Pleases Property Owners

Careless trimming of trees will lead to costly litigation and impair public relations. Permission from the property owner should always be obtained, and it is good policy to invite him to supervise the trimming. All branches directly over primary or street-lighting wires and limbs that may grow into the line or blow into it by a storm should be cut away. The trimming should start at the top and work done in a manner preserving the general oval shape of the tree. The cut should be made about an inch above a strong bud or small branch in order that the branch will develop and grow in the desired direction.

Spurs should never be used and to avoid injury to the tree the lineman should always use a ladder. Neither axe nor hatchet should be employed, the trimming should be done instead by means of pruning hooks. Tree-trim-

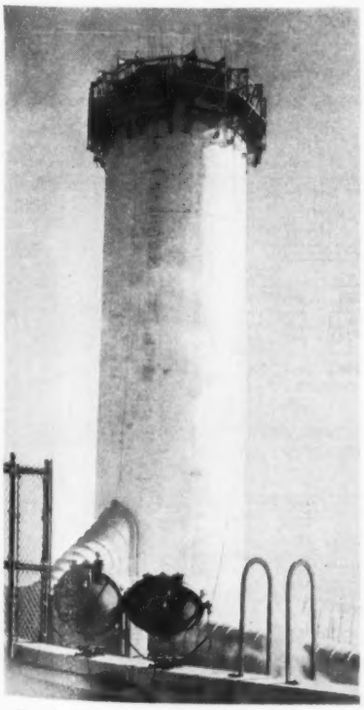
ENGINEERING PRACTICE

ming crews should treat all tree wounds that they find in connection with their work regardless of the original cause of the wound, shaving away all dead tissue and splintered wood, leaving the surface free, then painting it with coal tar to protect the heart from decay while the new growth is forming. Tree trimmers should always remove all limbs and twigs from the ground before leaving the job. The accompanying illustration covers instructions to West Penn System employees.


MAKE 3 CUTS IN REMOVING A LARGE BRANCH CUTS 1 AND 2 KEEP THE WOOD FROM SPLINTERING AND CUT 3 (FLUSH WITH THE TRUNK) LEAVES A SMOOTH SURFACE THAT WILL HEAL QUICKLY.
NOTE:- PAINT ALL SCARS OVER 2" IN DIA. WITH COAL TAR.
MAKE CUTS IN VERTICAL LIMBS AT AN ANGLE OF ABOUT 45° THIS WILL PREVENT WATER FROM COLLECTING AND SEEPING INTO THE WOUND.
RESULT OF IMPROPER PRUNING.
TREE TRIMMER SHOULD HAVE MADE CUT AT FORK. THE STUB HAS NOTHING TO FEED, (IT WILL DECAY AND DROP OFF) THE DECAY WILL WORK THROUGH THE BRANCH INTO THE TREE TRUNK AND EVENTUALLY DESTROY THE WHOLE TREE.
ALWAYS MAKE A CLEAN SMOOTH CUT. A JAGGED WOUND OR A SPLINTERED SURFACE WILL CAUSE DECAY

Tree surgery hints

Shortened Stack Eliminates Earthquake Hazards



Stack after reduction from 375 ft. to 197 ft. in height

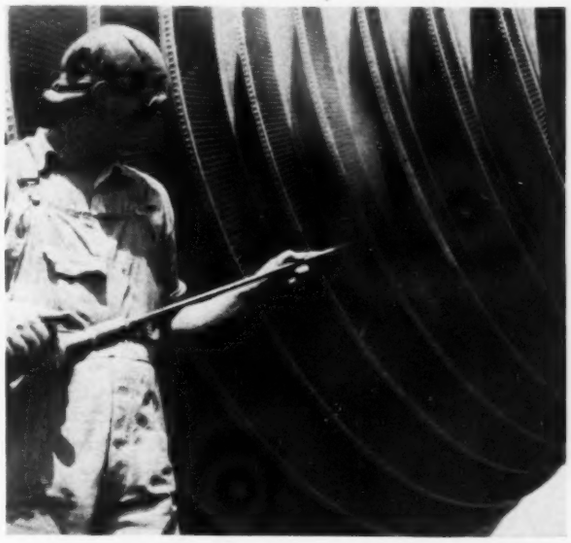
Seal Beach station of the Los Angeles Gas & Electric Co. is located in Long Beach, Calif., close to the fault around which was centered last year's earthquake in southern California. While the station and the stack withstood the shock of the last quake, it was felt that the 375-ft. stack would be a hazard to surrounding property should any future quakes be of higher intensity than the last. Consequently a crew was put to work with air-hammers to reduce the height to 197 ft.

In this operation the crew worked from scaffolding as shown in the accompanying illustration, chipping the top of the stack away and disposing of the refuse by dropping it down the interior onto a shock-absorbing mat composed largely of old tires. By providing suitable heat shields and removing waste material from the bottom of the stack on a conveyor it was possible to complete this unusual job without suspending the station from service.

Fly-Ash Cleans Turbine Blades Best

For removing the scale deposits that form on turbine blades over long periods of operation sand blasting is effective, but also destructive of the blading itself. Pulverized coal, blown with compressed air, will do the job, but the particles are not hard enough to do it very fast. Scraping by hand is satisfactory and also very slow. At the Cahokia plant of the Union Electric Light & Power Company, St. Louis, Mo., a new method of blade cleaning has recently been adopted.

Fly-ash was used in a gunite blower to clean the turbine rotor of a 50,000-kw. turbine. Results were very satisfactory, only two men being required to do the entire job and in about half the time formerly required for scraping. To verify the expectation that the ash was not wearing away the metal a spare blade was weighed on a laboratory balance before and after cleaning. Calculations, according to Edward Luxemberg of Union Electric Light & Power, showed that less than 0.0005 in. of metal was worn away.



Blasting scale from turbine blading with fly-ash

The trial demonstrated that blasting with fly-ash is superior to any other previously employed method for cleaning turbine blades. It is economical in labor; as a waste material from the pulverized fuel boilers at the plant the ash is inexpensive, and what is most important of all, the turbine blades are not damaged.

Thousands of Tons of Water +

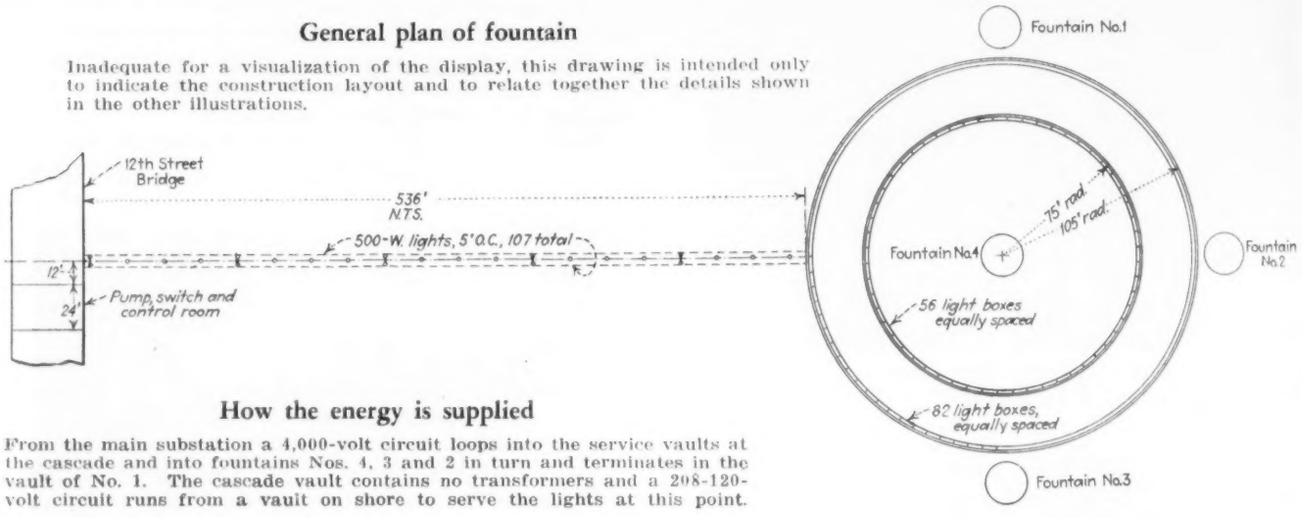
A Description of the Great Display of This Year's Century of Progress—Details of Its Electrical Features

By G. A. HACK
Chief Draftsman,
Electrical Construction Department,
A Century of Progress

"MOST spectacular squirt of past or modern times and one to give posterity pause in the effort to surpass it." This unofficial quotation from the irreverent pressroom is about the best short description so far offered of the great water and light display which will do for Chicago's 1934 edition of "A Century of Progress" what the Sky-Ride of 1933 and the Ferris Wheel of 1893 did to thrill and entertain Fair visitors. From the Twelfth Street bridge, which closes the north end of the north lagoon, will fall a broad cascade—168 ft. broad, to be exact, and about 16 ft. high. Extending south for 536 ft. from the middle of the cascade will be a continuous double tunnel of water formed by a line of nozzles whose alternate jets are trained to

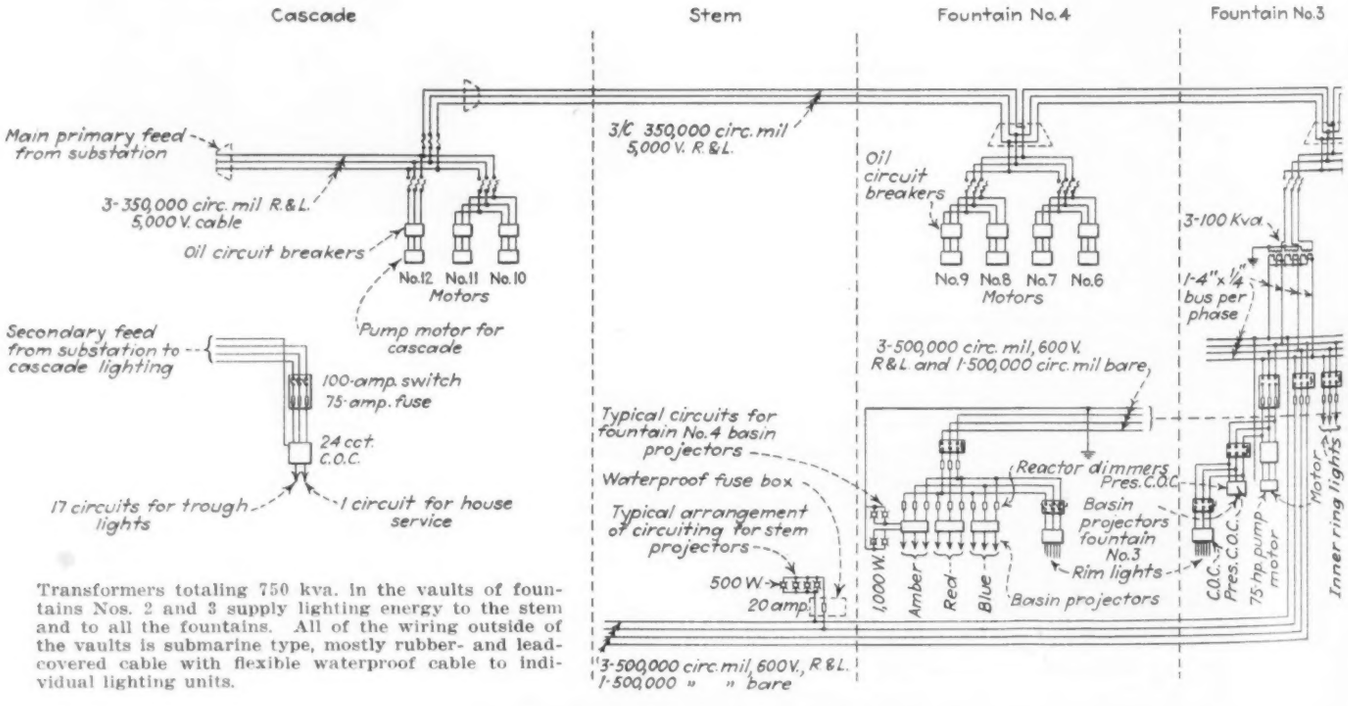
General plan of fountain

Inadequate for a visualization of the display, this drawing is intended only to indicate the construction layout and to relate together the details shown in the other illustrations.



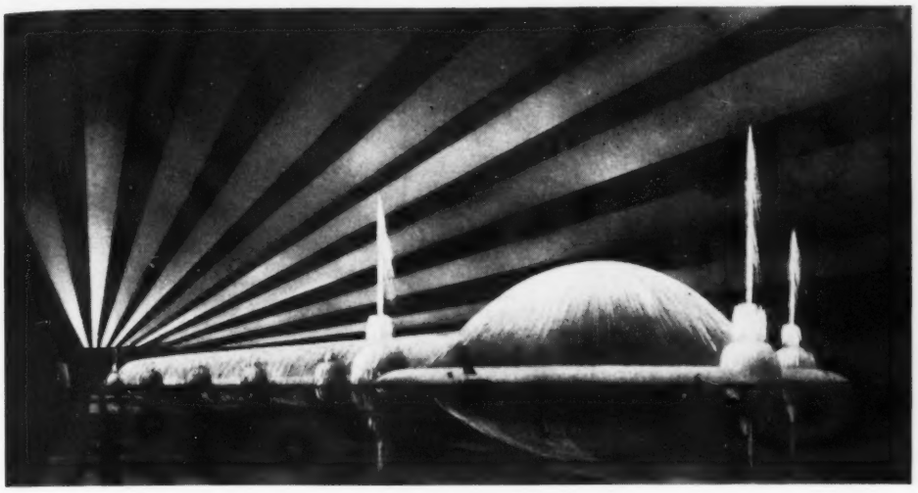
How the energy is supplied

From the main substation a 4,000-volt circuit loops into the service vaults at the cascade and into fountains Nos. 4, 3 and 2 in turn and terminates in the vault of No. 1. The cascade vault contains no transformers and a 208-120-volt circuit runs from a vault on shore to serve the lights at this point.



Transformers totaling 750 kva. in the vaults of fountains Nos. 2 and 3 supply lighting energy to the stem and to all the fountains. All of the wiring outside of the vaults is submarine type, mostly rubber- and lead-covered cable with flexible waterproof cable to individual lighting units.

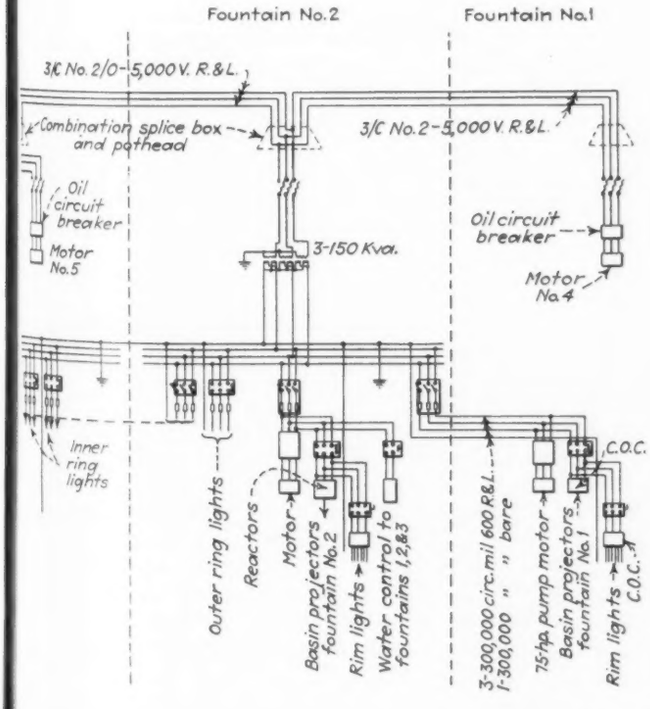
Millions of Lumens of Light = World's Fair Biggest Spectacle

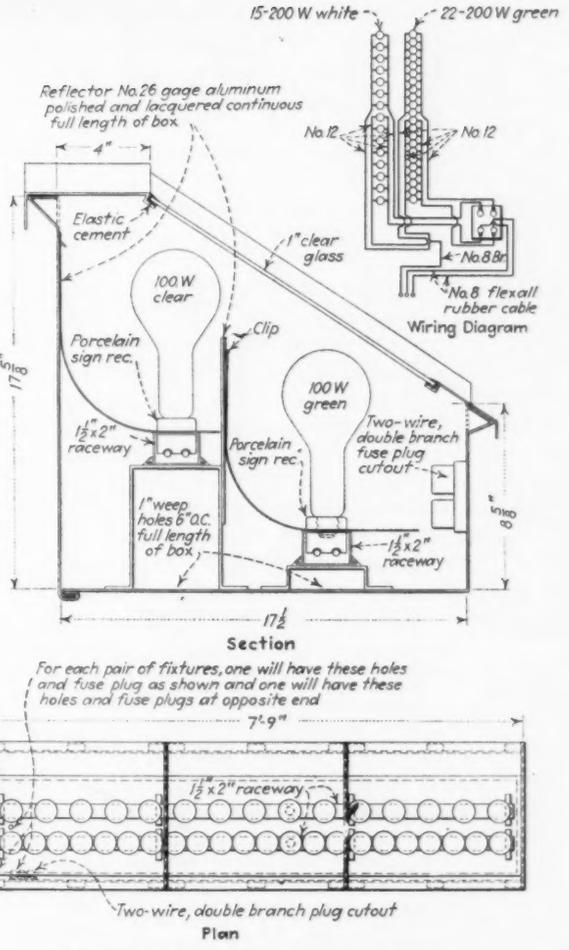


It will be more of a thrill to see this fountain than to read the details of its electrical construction. But perhaps those who read will be inspired to go and look. Certainly it is interesting to note the scope and splendor of this vast panorama of light. The 1934 World's Fair was scheduled to open this week.

opposite sides. At the end of the tunnel will be a dome of falling water 110 ft. in diameter formed by inclining the nozzles toward the center. From the center of the dome will rise a 75-ft. high geyser and three other lesser streams will flank it on the sides.

The tons of water for this grandiose display will come from thirteen pumps powered by nine 250-hp., one 200-hp. and three 75-hp. motors, a total of 2,675 hp. shoving out 68,000 gal. of water per minute, enough to serve a city of 1,000,000 people. But the water is only half of this remarkable fountain. Add to it 4,246 electric lamps



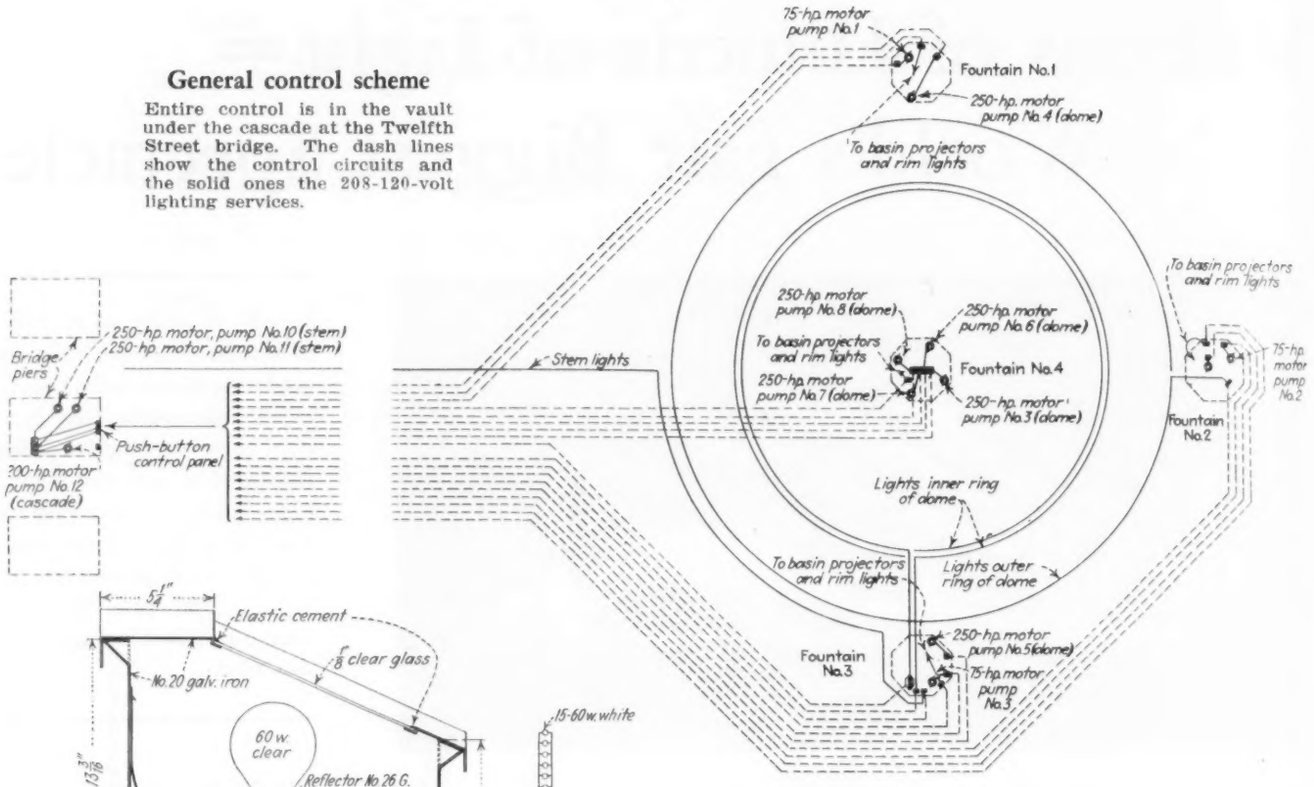


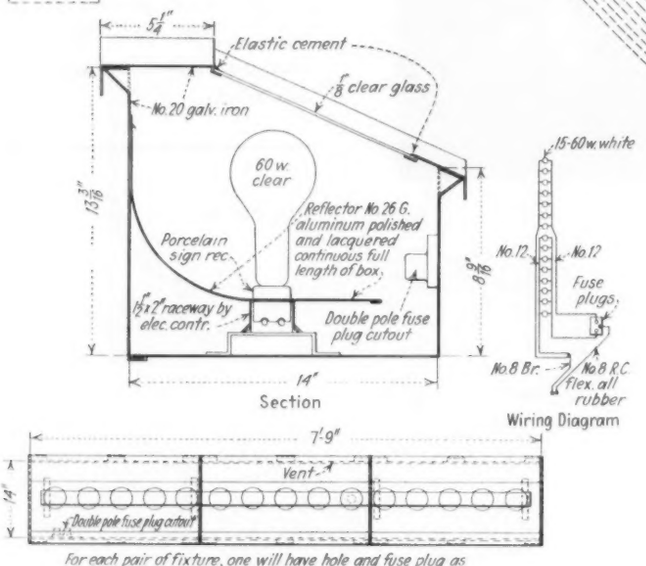
Outer light ring in water dome

A single row of 60-watt lamps, 82 sections of fifteen lamps each as in this drawing, constitute the outer ring in the water dome. As for the inner ring, sections are shop assembled.

General control scheme

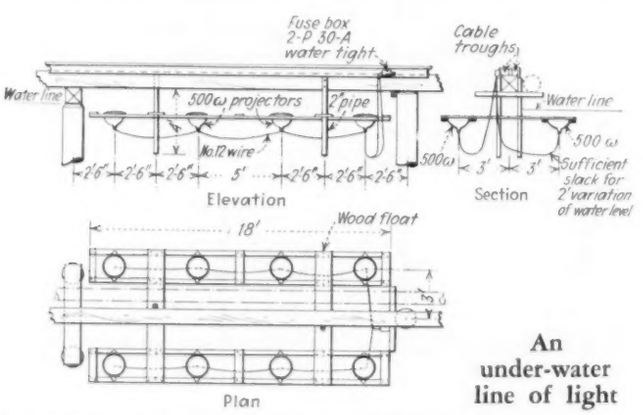
Entire control is in the vault under the cascade at the Twelfth Street bridge. The dash lines show the control circuits and the solid ones the 208-120-volt lighting services.


75-hp. motor pump No.1
Fountain No.1
250-hp. motor pump No.4 (dome)
To basin projectors and rim lights
To basin projectors and rim lights
250-hp. motor pump No.8 (dome)
250-hp. motor pump No.6 (dome)
To basin projectors and rim lights
Fountain No.4
250-hp. motor pump No.7 (dome)
250-hp. motor pump No.3 (dome)
75-hp. motor pump No.2
Fountain No.2
Stem lights
250-hp. motor, pump No.10 (stem)
250-hp. motor, pump No.11 (stem)
Bridge piers
Push-button control panel
200-hp. motor pump No.12 (cascade)
Lights inner ring of dome
To basin projectors and rim lights
Lights outer ring of dome
Fountain No.3
250-hp. motor pump No.5 (dome)
75-hp. motor pump No.3



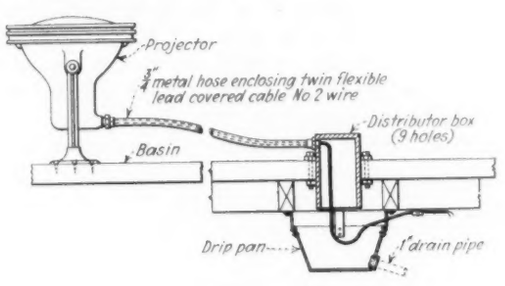
Over 2,000 lamps in inner ring of water dome

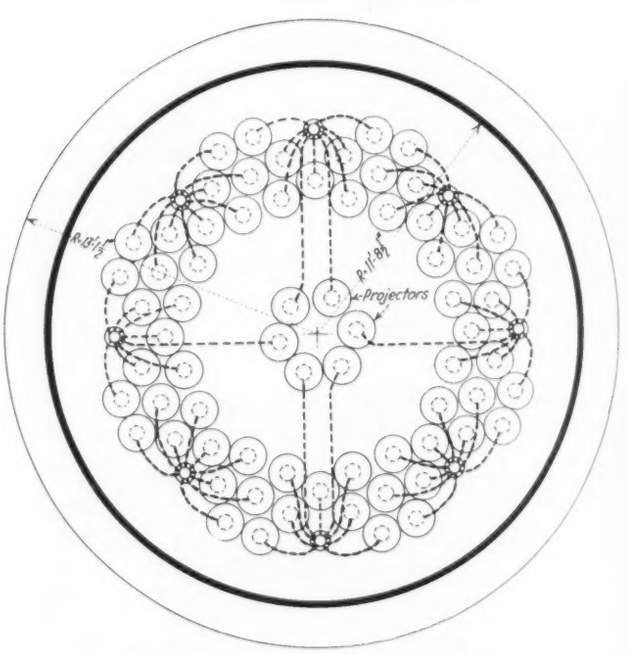
Two rings of changing colored light illuminate the huge water dome at the south end of the display. The inner ring contains 56 sections, like this detail, totaling 2,072 100-watt lamps. Sections are all shop-assembled and connected together on the job.



An under-water line of light

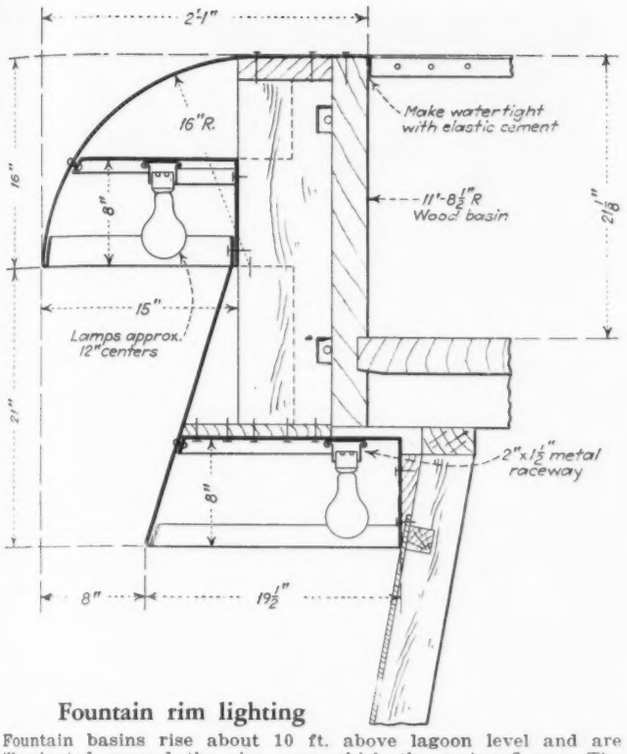
The 536-ft. water tunnels which connect the cascade and the water dome are illuminated by 214 500-watt submerged reflectors in a double row carried on wooden floats as shown here. Feeder line from which fused section taps are made runs along under the walkway on the line of piling.





Projector layout in fountain basins

All projectors in fountains Nos. 1, 2 and 3 contain 500-watt lamps, 72 in No. 2 and 36 each in Nos. 1 and 3. Projector mountings and connections are as shown in the detail.



Fountain rim lighting

Fountain basins rise about 10 ft. above lagoon level and are illuminated around the rim over which the water flows. The double rows of lights around each fountain rim, installed as shown in this detail, contain a total of 1,230 60-watt lamps. Pre-wired strips of metal raceway saved time in wiring.

—red, blue, green, amber and white—in sizes from 60 to 1,000 watts, totaling 507 kw., and you still won't have a good idea of the appearance of the fountain, but you will, perhaps, be inspired to go and look at a display so big that 2,500 kw. is required to operate it.

Because of the fact that all of the lights are in watertight compartments or reflector units, designed to operate submerged or in spray, and thus, in fact, to be water cooled, it would not take long to ruin 4,246 lamps if they were turned on before the fountain basins were filled and the water cascading in volume. Therefore the schedule of starting the various units is rigidly interlocked so that pumps will start in designed order before the lights are turned on. Control of the lighting in definite programs of color is accomplished by electron tube and saturated reactor combinations in automatic operation. General layout, construction details and wiring scheme are shown in the accompanying drawings.

Frequency Converter Serves 35 Years

"Old Faithful," the oldest frequency converter at the Staat Street substation of the Buffalo General Electric Company, has been retired. It has a record of 35 years of operation, without once being withdrawn from service for repairs. It was originally one of eight frequency changers, to convert 25-cycle Niagara Falls energy to 62.5 cycles for residential use. It is the last to be removed from service following the addition of Huntley station No. 2 in 1930, which delivers 160,000 kw. at 60 cycles.

The machine is a 400-kw. General Electric unit with a.c. generator rated at 2,200 volts full load, 91 amp. at 375 r.p.m., and a three-phase synchronous motor (type ATB) rated at 565 hp., 375 r.p.m., 350 volts and 25 cycles. In the 35 years the machine has converted more than 100,000,000 kw.-hr. of energy.

Informal opinions on present conditions and problems confronting the industry are helpful. We welcome to this forum the type of discussion presented by Mr. Eldridge and hope others will discuss industry questions here in a similar constructive vein.

Chief Engineer

Mark Eldridge says . . .

Memphis Power & Light Company

Break away from tradition if you would reduce distribution costs

Reports for kilowatt-hour output for the industry are showing a rapid improvement, and some companies report the making of new records for peak loads. If this continues it will soon be necessary to provide additional generating capacity and enlarge distribution systems. The latter will probably come first, for the new loads will not develop in the same places as the old loads, and, too, distribution systems were not being added to after the 1929 and 1930 peaks had been passed, as were generating stations.

So after the three- or four-year holiday we are about to resume distribution construction. How many are ready for it? To resume where we left off, using the old standards and methods, will not do. Forward-thinking engineers have gone ahead studying and planning during the holiday and are now ready with new ideas. To mention a few, there are, under the heading of improved service, the interconnection of lightning arrester grounds and secondary neutral grounds, rapid reclosure of oil circuit breakers or fuses, transformers of lower impedance, etc. Under the heading of reduced costs there are longer spans, lighter poles, redesign of pole top construction, bare wire, increased loading of transformers, etc.

In the past there was too much overbuilding of distribution lines and substations in anticipation of future loads. Studies shows that it is possible to design for progressive development, starting off with a capacity but little more than required for initial loads, yet with provision for step-by-step additions without replacements or rearrangements. This matter of distribution costs is most important, since it is the biggest factor in the cost of serving customers.

Two things stand out, however, to interfere with proper accomplishments: First, the difficulty in breaking away from traditional methods by distribution engineers, and, second, hampering rules and ordinances by municipal and state authorities.

Steel Descaling Now Automatic

With Photo-Cell Control This Essential Process Becomes Free of the Human Factor

By H. H. RAYMOND
Consulting Engineer the Stanley Works, New Britain, Conn.

In descaling steel in a strip mill water is sprayed upon the moving white-hot material at various points in its travel through the production department. The water is instantaneously turned to steam upon striking the steel, exploding the scale, which is then washed off by water under high pressure. Formerly it was necessary to manipulate the water valves by hand, but by utilizing photo-electric cells, relays and contactor switches the process has been made completely automatic. An installation at the mill of the American Tube & Stamping Company, Bridgeport, Conn., illustrates the advantages of this method.

After leaving the furnace the steel passes beneath a photo-cell (Fig. 1) which is hooded to prevent false operation from sunlight. The wiring from the cell is carried downward and away via the vertical conduit pipe shown and the entire mounting may be swung around in an adjustable bracket to clear it when not required during repair or other shutdown periods. The hydraulic valves are operated by General Electric thrustors and are actuated by the passage of the white-hot steel in range of the cell, the water being discharged only at times when the steel is in the proper position for spraying and washing off of scale. Several of these electric "eyes" are in use in the course of the material travel. In three cases the cells are mounted in goosenecks (Fig.2), the eye being in the head, which can be swiveled 360 deg. Here the steel travels through an inclosed guide and the light

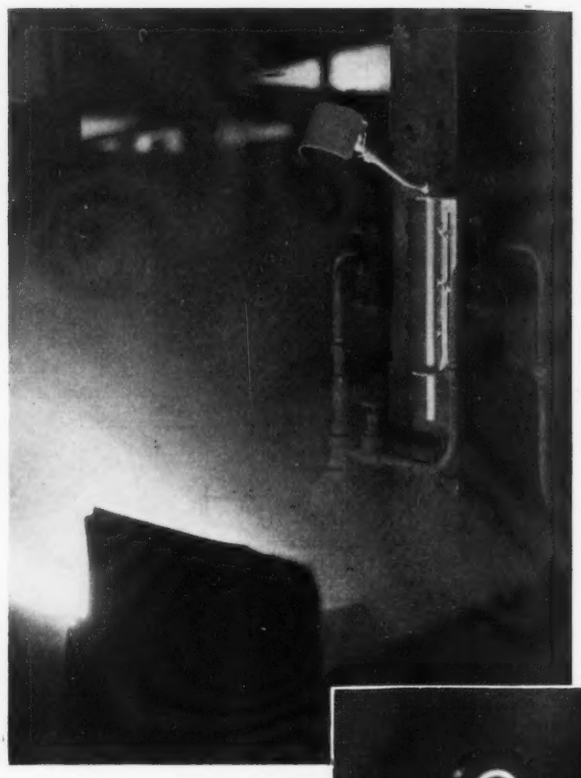


Fig. 1—Photo-cell mounted above hydraulic valves and moving steel strip

Fig. 2—Movable gooseneck in position above inclosed runway

Fig. 4—Typical control cabinet housing relays, contactor switches and pilot lamps

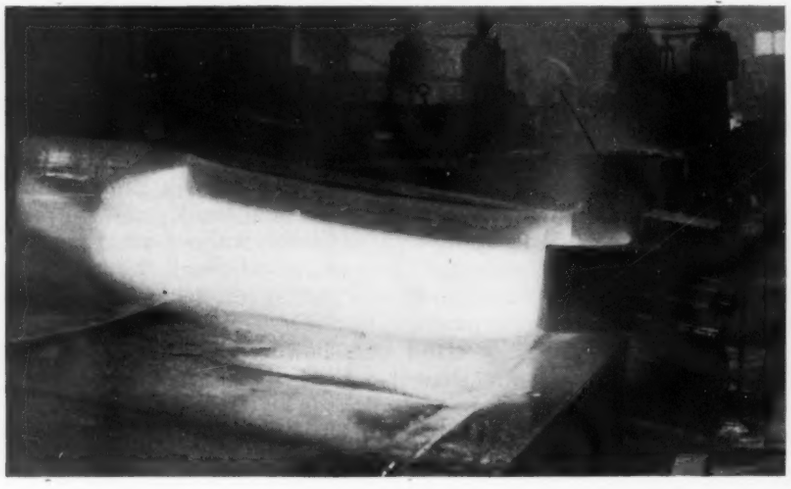
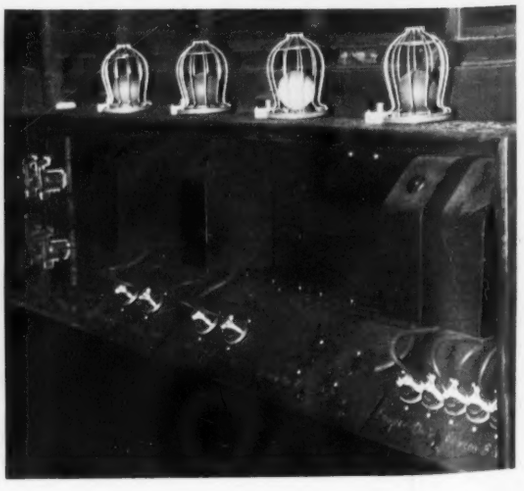


Fig. 3—As steel reverses direction, electric eyes in turret control water sprays



shines through a rectangular slot in the guide cover, remote control of water delivery being effected as before. The base of the gooseneck stand weighs 250 lb. and is easily transported by crane to new locations. The conductors are carried from the gooseneck by heavy-duty cable to conduit leading to the control panel. The stand may be tipped over or roughly handled without damage to the photo-cell.

At the turret where the steel loops around 180 deg. to reverse its direction (Fig. 3) four photo-cells are installed to control two water sprays. The eyes are located in a pit within the turret and the light from the steel reaches them through peepholes. A typical control cabinet (Fig. 4) contains four metal boxes carrying sensitive relays and power relays governing the valve operation. Two heavy-duty cords coming frm the bottom of each box are plugged into receptacles so that in case of trouble the relay unit can be easily removed and replaced with a spare. All units are interchangeable. A 440-volt contactor cabinet is at the left. Colored pilot lights on top show when the water goes on and off.

The system has been in operation for two years, new units having been added from time to time until the descaling process is entirely automatic.

The system is so reliable that all manually operated water valves and pipes leading to them have been removed. The mill could not operate if the control should fail to work. By the use of the interchangeable relay units and the portable electric eye stands no shut-downs have been necessary, and there is no doubt that these otherwise delicate controls are as permanent and reliable as other equipment in this large rolling mill.

Among the problems which had to be solved in working out this system were: Extreme heat; operation on bands from 2 in. to 10 in. wide; sunlight striking steam drifting in from other mills; salt water corrosion; rough handling; cobbles, when the steel goes wild; extreme vibration—even the ground trembles outdoors; whipping of steel loop to and from cells; dirt smoke and flying particles of steel in the air.

Weston "Photronic" cells and sensitive relays were used. Water valves, goosenecks, control cabinets, interchangeable relay units and photo-cell mountings, also engineering, were furnished by the Stanley Works.

How Nearly Perfect Should Meter Jewels Be?

By H. H. BROWN

Iowa Electric Light & Power Company, Cedar Rapids

Recent tests on 7,000 meters, averaging ten years old, showed 55 per cent of jewels defective. But only 34 per cent of the 7,000 meters indicated bearing troubles by slowness on a light load.

Out of a group of 7,000 meters on the Iowa Light & Power Company lines which had never had any routine maintenance since installed only 2,647 meters were found slow more than ½ per cent for all causes when tested at 10 per cent load. On full load test these same meters showed only 1,193 meters slow.* This indicates that friction sufficient to cause reduction in registration was present in 1,454 meters that were correct or fast under full load test. There were 3,166 meters fast under full load test and only 2,242 fast when tested at light load. This indicates that in addition to the meters above there were 924 meters that were fast at full load test which were slowed down by friction to either correct or slow for light load. This makes a total of 2,388 meters that were slower on light load test than on full load test for all causes. This amounts to 34 per cent of the meters tested in this group.

All of the jewels and pivots or balls were removed from these meters and replaced by new ones. Those removed were examined under a microscope and 55 were found to have defects sufficient to cause rejection. Since only 34 per cent of the meters were slower at light load than at full load and yet 55 per cent of the jewels had defects sufficient to cause their discard, there must have been 21 per cent of the jewels that were not causing undue friction, but were thrown out, assuming that all slowing down under light load was due to bad jewels, which, of course, is not correct. However, it does appear that something between 21 per cent and 55 per cent of the jewels were defective in some way and yet did not cause trouble.

From paper to Engineering Conference, Missouri Valley Electric Association.

How soon will defects cause trouble?

It might be argued that the jewels which showed defects would soon begin to make trouble if left in service. Since the maximum per cent of jewels which could have been causing trouble was 34 per cent and the minimum number which could not possibly have caused reduced speed was 21 per cent, it is very likely that not more than half of the jewels discarded actually did cause reduction in registration. The average age of these meters is a matter of conjecture, but since at least 70 per cent of them were Westinghouse type OA and General Electric type I-14 it would seem reasonable to assume that the average age was about ten years or more. It can only be concluded that it is possible for jewels with some defects to give a considerable length of service before they actually cause a reduction in registration.

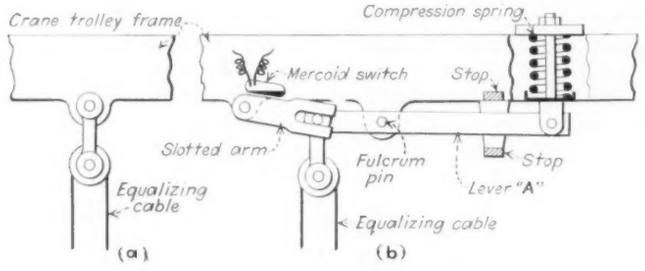
From the above it is evident that it should not be necessary to discard 55 per cent of the meter jewels. Probably 35 per cent would be sufficient, even allowing for those which will go bad within the next five-year period. This is taking into consideration that there are other causes as well as jewels which caused 34 per cent of these meters to be slower on light load than on full load. The problem then is to set up a standard of inspection which will accomplish about this result. Possibly a reduction in the magnification power of the microscope would do it, but I would certainly hesitate to recommend that step. I would prefer that the inspector be a little more lenient in regard to minor surface scratches, especially if near the edge of the jewel cup. It may be better to continue the high rate of discard, to make certain no bad jewels go back into service, and attempt to salvage the value of these discarded jewels by repolishing.

ELECTRICAL PRACTICE IN INDUSTRY

Mercury Switch Prevents Overloading of Shop Crane

By EZRA K. NICHOLSON
Cleveland, Ohio

Ordinarily, one of the usual forms of overload relay would have afforded ample protection against the overloading of a crane, used in removing the internal cartridges or chambers from synthesis tubes at the Belle, W. Va., plant of the DuPont Company. So balky were these internal cartridges, particularly when, as sometimes



Crane overloads prevented by mercurial control of supply energy
(a) Old form of unprotected suspension.
(b) Simple expedient based on mercury-switch control.

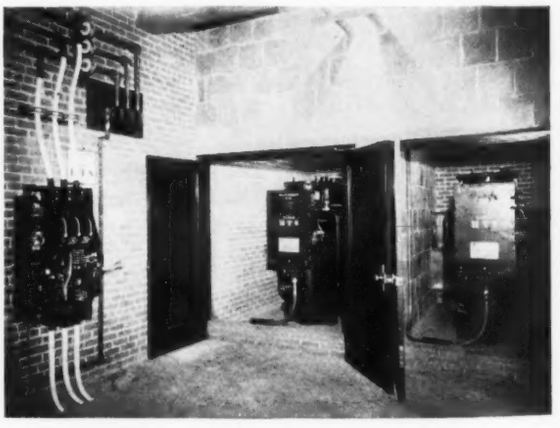
happened, they expanded unduly within the synthesis tubes, that instead of a steady pull being sufficient to remove them, it was neccesary for the crane operator to substitute a succession of mild jerks. In extreme cases this procedure permitted an altogether abnormal and mechanically, as well as electrically, destructive overload on the crane structure and motor. While the latter was protected by fuses, these generally would not blow before a rather heavy physical overload had been imposed on the crane itself by the inertia of the moving parts. Consquently, it became necessary to substitute another type of protection which would also take into account the space limitations as well as the requirement for safe operation in an explosive atmosphere.

In the figure (a) shows, diagrammatically, the former arrangement used to hold the equalizing end of the crane cable to the crane trolley frame, while (b) indicates the new arrangement used to disconnect instantaneously the source of power from the crane as soon as a predetermined load has been imposed on it. The pin in the crane trolley frame was slightly displaced to provide a fulcrum for the lever "A." The equalizing end of the crane cable was attached to the shorter end of this lever, while a semi-adjustable, coiled, compression spring was placed between the longer end of the lever and a projection on the crane trolley frame. Stops were provided for preventing an excessive amount of movement of lever "A" in either direction. A mercury switch, controlling the power to the crane, was attached to a short, slotted arm that was actuated by the shorter end of lever "A." Operation of the crane, using the mercury switch, is now wholly satisfactory.

Isolated Network Transformers Reduce Fire Hazards

To obtain a fire-resisting installation two 300-kva. network transformers serving the new municipal auditorium at Worcester, Mass., have been located in individual cells. The adjoining vault section, containing network protectors and cables, has been walled off from the main building. Little chance of smoke entering the building now exists to disturb a capacity audience of nearly 5,000 in case of short circuit in a transformer or protector. Two 13-kv. cables supply the service, these being carried across the main vault in iron pipe supported at intervals on angle-iron brackets, and each transformer is fed by a lead-covered cable brought down the cell wall to the floor as shown, a steel shield being provided to protect the sheath at the floor level in case of dropped tools. From the secondary terminals of the transformers the 120-208-volt circuits are run in conduit below the cell flooring and oil retaining sills to the open-type protectors mounted on the vault wall. An 8-in. tile wall separates the cells and fireproof doors are installed at their fronts. Each cell is provided with incoming and outgoing air ducts for natural draft ventilation.

From the protectors short cable taps lead to a hori-



Network transformer vault designed to prevent spread of arcs in case of short circuit

zontal set of 1¼-in. copper pipe buses which terminate in junctions with a set of rectangular buses with grounded neutral feeding the auditorium building through a wall separating the switchboard from the vault. Space is provided for a third transformer in case it is needed later and all of the equipment is thoroughly accessible despite its segregation.

LETTERS TO THE EDITOR

In Tightening Connectors

To the Editor of the ELECTRICAL WORLD:

The article prepared by C. C. Cornelius and published in your May 12 issue I believe to be of great importance to men connected with outdoor distribution construction. The reason for this is that continually increasing use of bolted type service connectors requires that some study be made of their characteristics rather than depending upon high-pressure sales arguments, or merely seeing how a nut spins on a service connector U-bolt. Mr. Cornelius points the way to the time when distribution engineers will specify the performance of service connectors the same as other pieces of equipment are covered by specification.

With that in view, may I point out that the inch-pound torque applied to tighten these connectors as indicated by Mr. Cornelius is much too low if we are to take into consideration actual field conditions. This statement is made after many weeks of checking in the field by a very simple test device that measures the torque applied to a service connector by a lineman simulating actual field conditions. We have found average field conditions for applied wrench torque in inch-pounds to be from 200 to 230. As random but representative examples picked in a number of Eastern states, we have found the following:

Tools Used	Torque, Inch-Lb.
Crescent wrench and pliers	225
Sleeve twister and pliers	185
Westcott wrench and pliers	232
Two pairs of pliers	210
Xcel wrench and vise	278
Offset wrench and hand	195
Offset wrench and vise	200
Straight socket wrench and hand	260

An average of twenty linemen using the identical tools they use in the field gave us a value of 208.5 inch-lb. torque. As far as we know, this is the first attempt made actually to gage the work done by linemen in installing service connectors in the field.

A. B. DIBNER,
Vice-President.
Burndy Engineering Company, Inc.
New York, N. Y.

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Mixed-Color Sources Bring Author New Light

To the Editor of the ELECTRICAL WORLD:

In the March 3 issue of the ELECTRICAL WORLD appears an article under my name entitled "Mixed Colors Show Intensity Paradox," in which I brought forth data to show that differently colored lights added together on a screen or test object do not add arithmetically to give a brightness equal to the sum of the individual brightness for each component shining alone, but that they "blend" somehow, giving a resultant light from 5 to 15 per cent lower than we might expect to get.

Since then I have continued the original research with more elaborate apparatus and more completeness. I found (with much amazement and no little consternation) that in this second series of measurements the laws of arithmetic as applied to colored lights hold quite rigorously within the errors of experimental measurement. Furthermore, library research shows that other experimenters (Abney, Ives, Tufts, etc.) have found the same thing to be true: that light, of whatever colors, adds arithmetically. That fact now seems to be convincingly demonstrated.

Yours from a better vantage-point,

I. J. SATTINGER,
University of Michigan.
Ann Arbor, Mich.

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That Motor Question

To the Editor of the ELECTRICAL WORLD:

In the April 28 issue of the ELECTRICAL WORLD, under the heading "When Motor Manufacturers Disagree Regarding Motorization," we note the exceptions of E. H. Cheney to some statements in the article by R. E. Hellmund, discussing single-phase motors for air-conditioning equipment.

The statement is often made that repulsion-starting single-phase motors cause radio interference, and that squirrel-cage do not. However, the usual understanding of this statement seems to be that it applies only during the starting period, and not during the running period. While even the squirrel-cage may cause some disturbance as the motor starts and switches to the running connection, it is usually not as noticeable as in the case of repulsion starting. However, the repulsion-starting period is so short that the interference, under ordinary circumstances, is of no more consequence than that caused by the ringing of a doorbell or telephone.

Likewise, the distinctions made by Mr. Cheney between the brush-lifting and brush-riding forms are also open to the criticism that one may infer that while brush-lifting motors do not cause radio interference, all brush-riding motors do. Repulsion-induction motors in which the commutator is in service during the running period, as well as during the start, will be inclined to cause interference when running, but brush-riding repulsion-starting motors will not unless the short-circuiting device is defective and does not effectually and completely short circuit the commutator, and under the same conditions the brush-lifting form might also cause interference.

It is natural that there is diversity of opinion in regard to motorization, and that manufacturers are disposed to favor devices or systems developed by themselves, as they have a background of experience that has led up to their particular developments and they naturally have more confidence in them than those with which they are not familiar.

Thus in the matter of integral size single-phase motors for such applications as air conditioning, our thirty years' experience with all types of single-phase motors and six years with the repulsion-starting capacitor motor has convinced us that the repulsion-starting capacitor motor includes more of the desirable features for this work than any other form of single-phase motor so far developed. It operates at exceptionally high efficiency and at substantially unity power factor, is quiet in operation and starts with a high locked rotor torque and a minimum of line disturbance, and it is also competitive in price compared with the repulsion-starting induction motor.

EDWARD BRETCH.
Advance Electric Company.
St. Louis, Mo.

BOOK REVIEWS

Building an Engineering Career

By C. C. Williams. Published by the McGraw-Hill Book Company, 330 West 42d Street, New York, N. Y. 241 pages, illustrated. Price, $2.

Motivation toward a specific objective is one of the announced purposes of the author, who as dean of engineering at Iowa State guides his students in orientation lectures. The functions of the engineering profession are defined and their realms and rewards discussed. Study of engineering is differentiated from study of other subjects. History of materials and engineering practices is traced from primitive times alongside the evolution of machines.

The mature engineer will get from the book a ready means of guiding embryo engineers, a multitude of data of "firsts" in engineering and several interesting charts of professional functions and activities. The book gives a sane and modest portrayal of engineering as a profession.

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Conjugate Functions for Engineers

By Miles Walker. Published by Oxford University Press, 114 Fifth Avenue, New York, N. Y. 113 pages, illustrated. Price, $4.75.

Dr. Walker believes engineers could make more practical use of the Schwarz-Christoffel transformation in connection with conjugate functions. This mathematical technique affords a direct way of dealing with flow lines and equipotential contours in constricted and irregularly shaped media. He derives the expressions for both systems in considerable detail for such situations as electrolyte currents between two unequal cylinders, current flow between adjacent corners of a uniform plate, pole flux fringing, air-gap reluctance of deep slots, etc.

The same principles are applicable to heat flow and aerodynamic phenomena under comparable conditions. The practical examples solved in full by these methods should fortify designers to make more direct solutions where empiricism is resorted to by those who know the rudiments of conjugate functions, but lack the aptitude to make practical application of them. Only this virtue can justify such a high price for such a short but meaty book.

NEWS OF THE WEEK

T.V.A. Begins Appliance Sales

Tupelo, Miss., opens Electric Home and Farm Authority program. Nineteen manufacturers present approved ranges, refrigerators, and water heaters.

T.V.A.'s experiment in domestic load building began this week. On May 21, in the small city of Tupelo, Miss., first to sign a contract for T.V.A. power, the sale of approved appliances got under way under Electric Home and Farm Authority auspices.

More than 500 appliance prospects registered at the opening of the authority's Tupelo display room, E.H.F.A. officials report. No sales were permitted on the showroom floor, the business developing from the display being closed in dealer stores. Initial sales of appliances under the program are being made through approximately 250 retail outlets of co-operating utilities and 100 dealers. Tupelo dealers' showrooms were thronged during the first two days of the display, and a flood of inquiries developed a number of live prospects, the dealers report.

Ranges, refrigerators and water heaters, manufactured by nineteen manufacturers and approved by E.H.F.A. as to price and quality, were available to purchasers on a cash or long-term financing basis. Refrigerators retail at $80 or less; electric ranges at $77.75 or less, and water heaters at $62.80 or less. All appliances bear the thunderbolt insignia of T.V.A. approval. Sales will shortly begin in all areas served directly by T.V.A. power and in the territories served by Commonwealth & Southern utilities in Tennessee, Alabama and Georgia.

Time-payment terms announced

Sales made on time payment will be financed by E.H.F.A. A single appliance may be financed over a period of three years or less. Purchase of two or more appliances will be financed over a period of four years or less. Down and monthly payment on a single purchase will be fixed at a minimum of $2.

"Participation in the plan," said David E. Lilienthal, T.V.A. director, "is open to all retailers who are approved by the manufacturers of emblem appliances. The retailer wishing to participate will make application to the manufacturer for sale of the financed appliance. On notice from the manufacturer, E.H.F.A. will notify the dealer of his approval as a licensed retailer to sell E.H.F.A.-financed appliances." A finance chart will be given to dealers on which they will determine the amount of down payment and monthly installment. The retailer delivers the purchaser's contract to the utility serving the purchaser and the utility pays the retailer the cash sale price of the appliance less the down payment. Installments will be collected as part of the monthly electric bill.

All licensed dealers will be treated alike, Mr. Lilienthal stated. Uniform selling prices will be maintained by all retailers, including merchandising departments of utilities. Sales in territory served by other utilities and municipal plants in the valley states will be authorized upon application of those utilities and adjustment of their rates.

The approved manufacturers

The nineteen appliance manufacturers whose products have been approved as to quality, design and price thus far by the Electric Home and Farm Authority are:

Ranges—A-B Stove Company, Edison General Electric Appliance Company, A. J. Lindemann & Hoverson Company, Malleable Iron Range Company, Landers, Frary & Clark, Westinghouse Electric & Manufacturing Company, Estate Stove Company.

Refrigerators — Kelvinator Corporation, Leonard Refrigerator Company, Norge Corporation, Frigidaire Corporation.

Water Heaters — Malleable Iron Range Company, Westinghouse Electric & Manufacturing Company, Cleveland Heater Company, A. J. Lindemann & Hoverson Company, Hynes & Cox Electric Corporation, McGraw Electric Company, Edison General Electric Appliance Company, Philadelphia Electrical & Manufacturing Company.

N.E.M.A. Sees Brighter Outlook

Hot Springs meeting of electrical manufacturers hears encouraging reports on code progress and business conditions. Tritle defends code. Asks self-control for industry. Robertson sees lack of confidence barring credit flow.

Encouraging reports were made on code progress and on business conditions to the 400 electrical manufacturers attending the meeting of the National Electrical Manufacturers Association at Hot Springs, Va., this week. Two general meetings were held, in addition to numerous section meetings.

In his address, N.E.M.A. President J. S. Tritle reviewed the work of the year. He stated that the industry had remained comparatively free from labor troubles. He pointed out that the force and influence of the government was now a definite factor in business and that N.E.M.A. had recognized this fact by formulating one of the first and best codes and placing it in operation. This code is based upon self-government by industry, Mr. Tritle said, and it has worked well despite charges that collapsed when scrutinized.

N.E.M.A.'s NRA code has worked well, President J. S. Tritle told the annual meeting of electrical manufacturers this week

Defending the N.E.M.A. code as "sound," Mr. Tritle asserted that it had been operated "cleanly and honestly." It has prevented destructive competition, improved the wages and standards of labor and improved the general level of business, he held.

Tritle opposes Wagner bill

In that section of his address devoted to business events in Washington Mr. Tritle voiced strong opposition to the Wagner bill because it seemed to be drawn upon the inference that employers and employees are antagonistic. He stated that the code authority committees recently formed had done much to improve prospective legislation and to limit the unwise extension of governmental powers over business. Further powers should not be given NRA and industry must take a strong position for self-control.

Markets for electrical manufacturers were stressed by Mr. Tritle. The opportunity for increased appliance sales to homes must be backed up by aggressive efforts, he said.

The uncertainty that hangs over business in the form of uncalled-for legislation stands as the one great obstacle to be removed before a rapid recovery can proceed, Mr. Tritle asserted. An utter loss of confidence in NRA has developed in recent days, which the Darrow report will intensify, he said.

Robertson speaks on credit

A. W. Robertson, chairman of the board of Westinghouse Electric & Manufacturing Company, laid the retardation of industrial recovery to a lack of confidence in the future. Laws or legislation cannot bring about willing lenders or will-

ing borrowers, Mr. Robertson said. Credit is money and psychology operating together. There must be confidence in today and tomorrow, for most borrowing is done for tomorrow, he said. Just now there is no use of credit because there is no confidence. No one is sure of tomorrow when changes are occurring every minute. There is no confidence in labor, in property rights and in management rights. There is no stability, and this must be had.

At the second open meeting on Tuesday Clarence L. Collens, president of the Reliance Electric & Engineering Company, spoke of his experiences and policies in supervising code administration. He gave a very encouraging report of progress made and stated his belief that the practices called for in the N.E.M.A. code were fair and would work. While there were no complaints of sales below cost, there were practical business problems in working out an open price policy for an industry group.

F. C. Jones, president of the Okonite Company, also spoke about code operations. The industry can do under the code most of the things it wanted to do, Mr. Jones stated. The code permits of fair profits and stable business conditions if industry will carry out its principles. Each group must work out its own controls, its own rules and regulations, and not wait for outside efforts. Each member of a group is a detective to find and report non-compliance cases, he said. There must be education, discipline and confidence to get results, Mr. Jones added.

F. E. Neagle, N.E.M.A. counsel, reported on the status of supplementary codes in Washington. Apparently minimum wages apply to all localities, with a permissive power to the administrator to lower this in the South, Mr. Neagle's address indicated. Those employed who are physically or mentally handicapped will receive at least 80 per cent of the minimum. Detail changes will probably be made in some of the other clauses, and it is hoped that final approval may be had shortly, Mr. Neagle said.

The section meetings were well attended and a note of optimism prevailed because of the very much improved business volume reported for this year.

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Utilities Win Tax Case

Public utilities of Pittsburgh won their court fight against the $2 meter tax last week when Judge Elder W. Marshall in an opinion held the city meter tax ordinance unconstitutional. The bill became a law February 17. Instead of paying the tax, the utilities, led by the Bell Telephone Company, went to court.

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P. G. & E. Lines Valued

Just compensation of $220,000 has been fixed by the California Railroad Commission as a fair value of the distribution lines of the Pacific Gas & Electric Company in the territory of the Modesto Irrigation District. The valuation is the result of proceedings started by the district for the ultimate condemnation and purchase of the company's system in the territory where both organizations were in competition.

Code Authority Change Urged

Darrow report to President suggests non-member and administration representation on N.E.M.A. code board. NRA reply calls report "Superficial and intemperate." Inaccuracy in findings noted.

A change in the administrative set-up of the code authority for the electrical manufacturing industry to include non-members of N.E.M.A. is recommended in the long-awaited Darrow report to President Roosevelt this week. As a result of the examination of this and seven other codes by Chairman Clarence Darrow and his five associates on the National Recovery Review Board, the board, one member not signing, summarized its findings regarding the electrical manufacturing code as follows:

"The monopolistic conditions existing in this industry do not result from the code, but from the control of patents and other long-standing factors. Ninety-three per cent of the incandescent lamp division of the business is, and long has been, in the hands of one corporation. No evidence was presented that would justify the board in formulating any decision in regard to the possible oppression of small enterprises. It is, however, true that the Code Authority, or what corresponds thereto, is composed of members of the National Electrical Manufacturers Association, and no provision is made for the representation of manufacturers who are not members of that association. We deem this to be wrong, and recommend that it be corrected."

This statement by the board is clearly inaccurate. Article 7 of the N.E.M.A. Code provides that any member of the industry not a member of N.E.M.A. may share in the activities of any supervisory agency under the code, by paying his pro rata share of the cost of administering the code. This provision was in the original code and is further emphasized in revisions now pending.

No monopoly found

Basing its recommendations on its March 15 hearing of the complaint of the Incandescent Lamp Makers' Association against the code and national code authority, the report submitted to the President found:

1. That the code was drawn by and placed under the supervision of members of the National Electrical Manufacturers Association without provision for representation of non-members of N.E.M.A.

2. That suits against small distributors, jobbers and retailers all relate to a period prior to the enactment of the code, and therefore the board is unable to make a finding relative to monopolistic tendencies or oppression of small enterprises under the code.

3. That the alleged monopoly in the branch of the electric industry known as Incandescent Lamp does not exist by reason of the code.

New make-up of authority proposed

The report asks a new set-up of the code authority of the industry. Three groups would comprise the authority membership. In addition to the board of governors of N.E.M.A., not exceeding thirty members and three members without vote, to be appointed by the administration, representation on the authority would be granted to non-members of N.E.M.A. These additional members, called "contributing non-members," would comprise members elected by employers not members of N.E.M.A., but who have agreed to bear their pro rata share of the cost of creating and administering the code. The number of non-members on the authority would be determined on the basis of the sales of contributing non-members and would bear the same proportion as the representation of employer members of the N.E.M.A. bears to the sales of its members, such figures to be determined by the authority.

A recommendation was made to add to the code an article prohibiting threats of suit for patent or trademark infringement among customers of another employer. The prohibition is effective if the threat is "not made in good faith, but for the purpose of having the effect of harassing and intimidating the customers of another employer." The article also includes a clause requiring notice of suit be given by the suing employer fifteen days before filing of action.

NRA's reply calls report "superficial"

General Hugh S. Johnson, NRA Administrator, termed the report "superficial and intemperate," in his reply to the Darrow report, released simultaneously. A detailed summary of the reports made to General Johnson by several code administrators was developed by NRA Counsel Donald Richberg. Of the Darrow report on the electrical manufacturing code, Mr. Richberg said:

"The board gave no notice to the NRA and made no request for information, although every complaint presented had been covered during months of extensive work upon this code. After three days of fruitless hearings the board was forced to its conclusion than any 'monopolistic conditions in this industry do not result from the code, but from the control of patents and other long-standing factors.' The board then recommended additional members for the code authority—a matter brought up by NRA two months before the hearing and agreed to by the industry."

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Lost Customers Regained in Birmingham Drive

In a campaign inaugurated to regain lost customers, the Birmingham Electric Company added approximately 7,000 accounts in the period from July, 1933, to April 1, 1934. There were 13,000 dead services on the lines when the campaign opened. During this period the company accepted applications for service without the customary deposit, 10 per cent being added to the net monthly bill until the regular deposit of $2.50 had accumulated. Where a former customer owed the company an old bill for service an additional 10 per cent was added to the monthly bill to liquidate the old bill.

Northwest Group Discusses Operation

Annual meeting at Portland centers attentionnaire . . . House refuses R.F.C. loans and steam plant operating problems.

Operating problems held the center of attention at the annual meeting last week of the Engineering and Operation Section of the Northwest Electric Light and Power Association. The two-day meeting, held at Portland, Ore., included in its program a discussion of new wiring methods, a symposium on power factor, load building and hydro and steam plant operating problems.

A general description of the federal hydro-electric project on the Columbia River at Bonneville was presented by C. I. Grimm, chief civilian engineer for the Army Engineers constructing the Bonneville Dam. A description of some of the tests now being conducted on draft tube and scroll case design for the 60,000-hp. Kaplan adjustable-blade, propeller-type turbines to be installed at Bonneville was given by H. L. Cooper of the consulting engineering staff.

Engineering developments traced

J. O'R. Coleman of the Edison Electric Institute engineering staff outlined national trends in engineering, discussing particularly experiments in quick breaking and reclosing of line switches. Mr. Coleman also related a new method of measuring the amperage flow in lightning discharges by the use of condenser paper between copper plates. H. L. Melvin of the Electric Bond & Share Company reported on the progress made by a joint committee of the E.E.I. and N.E.M.A. in co-ordinating insulation standards for various voltages and for various pieces of apparatus.

A new method of effecting service entrance to residences, using the inverted sequence metering with the new three- and five-wire service entrance cable, was suggested by S. B. Clark, Northwestern Electric Company. The cost of these installations was shown to be from 62 to 71 per cent of the cost of similar installations using rigid conduit. This new method was shown to be practically immune from jumpering. Related to the latter phase of this subject was a paper on preventing energy theft by L. D. Snow, Puget Sound Power & Light Company, which concluded that an expense of $50 to $60 per customer suspected of energy diversion was justified to correct such diversions.

Power factor discussed

Two papers on power factor, a résumé of present conditions on power systems in the Northwest by O. D. Lanning, Eastern Oregon Light & Power Company, and the effect of low power factor loads on distribution feeders by John Bankus, Portland General Electric Company, brought forth a discussion which generally leaned toward the theory of charging the customer for the reactive kva. Customers then have the choice of correcting their power factor or paying in the rate for the reactive component.

A large number of those attending the meeting journeyed to Corvallis, Ore., to take part in the joint meeting of the Portland Section of the A.I.E.E. and the student branch of that organization.

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Northeastern A.I.E.E. Hears of Advances

Power supply problems engage interest at three-day Worcester meeting. Transmission control developments stressed.

Gratifying progress in solving problems in electrical transmission and utilization featured the regional convention of the northeastern district of the A.I.E.E. at Worcester, Mass., last week. The three-day program was enjoyed by a large attendance, headed by President-elect J. Allen Johnson. Among the advances brought out were a new type of warble tone oscillator, by Prof. W. H. Bliss of the University of Maine; a vacuum-tube-controlled rectifier with marked industrial control possibilities, by C. B. Foos; a new relay for use with delta-connected primaries, briefly mentioned by F. M. Starr of the General Electric Company. Two transmission papers were presented by E. H. Bancker and E. M. Hunter on "The Behavior of Distance Relays During System Oscillations," and Robert Brandt, New England Power System, Boston, on "Speed Control Problems in Interconnected Operation." R. E. Hellmund and C. G. Veinott of the Westinghouse Electric & Manufacturing Company presented a paper on "Irregular Windings in Round Rotor Induction Motors" at an electrical machinery session. Several papers from college and university laboratories enriched the program.

The various papers pointed toward an ever-increasing refinement of control in transmission and utilization, with better comprehension of causes of instability and possible remedies. Relaying was shown to have attained a more reliable stage than formerly, and the value of better system protection was set forth on the basis of considerable experience in both transmission and distribution practice. Recent extensions of interconnection have given rise to problems which require engineering analysis, notably between upper New York state and the metropolitan district.

COMING MEETINGS

Edison Electric Institute—Atlantic City, N. J., June 4-7. B. F. Weadock, 429 Lexington Ave., New York.

Canadian Electrical Association—Annual convention, Seigniory Club, P.Q. (Lucerne-in-Quebec), June 13-15. B. C. Fairchild, 409 Power Building, Montreal, Que.

Public Utilities Advertising Association—Annual convention, New York City, June 17-20. Eric W. Swift, Commonwealth Edison Company, Chicago, Ill.

American Society of Mechanical Engineers—Semi-annual meeting, Denver, Col., June 25-28. Calvin W. Rice, 29 W. 39th St., New York.

American Institute of Electrical Engineers — Summer convention, Hot Springs, Va., June 25-29. H. H. Henline, 33 W. 39th St., New York.

. . . THIS WEEK IN WASHINGTON

Light and power code near, General Johnson says . . . P.W.A. allots $300,000 for national rate survey . . . Industry criticism to be asked on power survey questionnaire . . . House refuses R.F.C. loans for municipal plants.

A CODE for the electric light and power industry will be forthcoming in the near future, Gen. Hugh Johnson, NRA head, stated Tuesday. He emphasized that this code is being undertaken by the industry on a voluntary basis.

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An allocation of $300,000 has been made by the Public Works Administration for the survey of electric rates to be made by the Federal Power Commission. The questionnaire that will be sent out in connection with that survey is in practically final form. Various changes in the original questionnaire were made after Dr. Fayette S. Warner, chief of research for the Federal Power Commission, and L. B. Woll, of the commission's staff, had gone over the questionnaire with a number of private power companies and with the operating officials of several municipal plants. The changes were made so that the questionnaire would conform more clearly with the way in which the records are kept.

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The more elaborate questionnaire being formulated for use in connection with the commission's general power survey is about to be completed. It will be sent out in the same way for study by operating officials, who will be asked to submit criticism and suggestions.

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By a vote of 97 to 59 the House of Representatives, on Tuesday, refused to amend the direct loans to industry bill so as to authorize R.F.C. loans to cities for the purpose of buying in electric distributing systems. A similar amendment was defeated in the Senate when the bill was before that body.

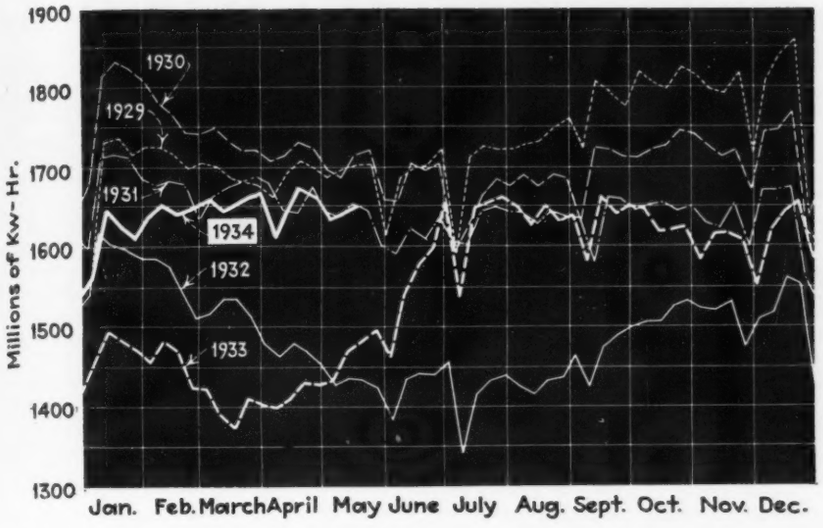
PAUL WOOTON,
Washington Correspondent.

Easy Bond Vote Opposed by Municipal Utilities

Reduction of the vote required to carry general obligation bonds for municipal utility purposes from two-thirds to 51 per cent of the vote cast was not approved by the Missouri Association of Municipal Utilities. At its annual convention last week at Slater the association voted to make no fight for the submission on referendum of the questions of legalizing the issuance of revenue bonds and the easy bond vote. It was the belief of many of the speakers that a bond issue for a home-owned utility voted by only half of the citizens would leave a fertile field for competitive operation by a private rival.

The sessions of the convention, attended by some 150 persons, dealt with the problems of municipal utility management.

Week's Output Rises Again



For the past month the output of central electric light and power stations, as announced by the Edison Electric Institute, has been very close to that of 1931 and much in excess of 1932 and 1933. This was again the case in the week ended May 19, when production rose for the second consecutive week and reached 1,649,770,000 kw.-hr. There had previously been a slight decline, after the abnormal increase earlier in the year.

The new figure surpassed that of the corresponding week of last year by 11.2 per cent and of 1932 by 15 per cent. It virtually matched the highest week of February and surpassed any in January. This has never happened before in any year for which weekly data are available.

On the Pacific Coast the lead over 1933 has been climbing steadily and has now risen to 16.5 per cent. In the Mountain states it continues well over 20 per cent. In the Central industrial area, where the energy figures a year ago were reflecting the growing activity in the automobile and related industries, it approaches 15 per cent. In the East it exceeds 8 per cent.

Weekly Output, Millions of Kw.-Hr.

1934	1933	1932
May 19...1,650	May 20...1,483	May 21...1,436
May 12...1,643	May 13...1,468	May 14...1,437
May 5...1,633	May 6...1,436	May 7...1,429
Apr. 28...1,669	Apr. 29...1,428	Apr. 30...1,455
Apr. 21...1,673	Apr. 22...1,431	Apr. 23...1,470

Per Cent Change from Previous Year

Region	Week ended May 19	May 12	May 5
New England	+ 8.5	+ 9.1	+13.0
Middle Atlantic	+ 8.6	+ 7.7	+10.2
Central Industrial	+14.6	+15.5	+16.3
West Central	+ 8.8	+ 8.7	+ 6.5
Southern States	+ 5.0	+ 7.6	+11.5
Rocky Mountain	+21.8	+25.5	+26.8
Pacific Coast	+16.5	+16.0	+15.3
United States	+11.2	+11.9	+13.7

British High-Frequency Electric Furnaces

Two high-frequency electric furnaces of 2- and 5-ton size have been recently added at the Samuel Fox & Company, Ltd., works of the United Steel Companies, Ltd., at Stocksbridge, near Sheffield, England. According to *Electrical Review*, the new plant will be used to make steel for such purposes as aircraft, racing cars, tools and dies, welding rods, ball and roller bearings. The furnaces are also especially suitable for the production of heat-resisting stainless, permanent-magnet, non-magnetic and nitrogen-hardened steels. Space is provided for a 10-ton unit to go in when production warrants it.

Tilting controls and switches are interlocked and the voltage, power and power factor of the furnace during the melting period are automatically controlled. The equipment was built from purchaser's specifications by the Electric Furnace Company, Ltd., in conjunction with Metropolitan-Vickers Electric Company, Ltd. The furnaces, whose normal operating frequency is 1,250 cycles, are supplied power by a 1,500-r.p.m. motor-generator located in a separate building. The generator is an inductor homopolar single-phase machine of new Metropolitan-Vickers Company design. It has two 625-kw. stator windings and a common rotor, but there is no interaction between the magnetic circuit of one stator and the excitation winding of the other. Each stator voltage is 1,500 at full load, but that of each can be separately controlled and applied to two furnaces operating at the same time, or the two stators can be connected in series to give 1,250 kw. at 3 kv. Furnace power factor averages about 0.1, with considerable fluctuations, tending to fall as the charge becomes molten. Power factor at the alternator is kept at about 0.8 by automatically varying the number of static condensers on load.

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Lignite-Electric Plant

An "at-the-mine" steam station has been placed in operation by the Société Minière et Electrique des Landes which utilizes lignite to supply a substation of the Midi of France Railway Company. The operators hold a concession for the working of about 88 square miles of lignite deposits in the French Departments of Gironde and Landes. The estimated supply is 170,000,000 tons and the lignite at present is used in a 25,000-kw. station adjacent to the mines. The power is generated at 6,000 volts and stepped up to 37,000 kv. for transmission to the railroad at Pessac, near Bordeaux, a distance of about 23½ miles.

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March Canadian Output Far Above 1930 Level

Central electric stations in Canada created new high records in March in both monthly and daily outputs. Total production for the month was 1,795,616,000 kw.-hr., and the average daily output was 57,923,000 kw.-hr., which exceeded the previous daily record made last February by 0.6 per cent, the Dominion Bureau of Statistics reports. Exports to the United States amounted to 112,114,000 kw.-hr. Delivery of 432,393,000 kw.-hr. to electric boilers was also a new high record.

The increase during the past six months has been extraordinary. It carried the March figure 31 per cent higher than in 1933 and 18 per cent higher than in 1930, when the previous record was made for the month.

In the province of Quebec the production of 881,766,000 kw.-hr. from water power was exceeded only once, in November, 1933; the output a year ago was surpassed by 18 per cent. Ontario, with 603,517,000 kw.-hr., was 72 per cent ahead of 1933 and 14 per cent over 1930, using March figures in each instance.

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Mercury Station Output at 10,584 B.t.u. Rate

For the twelve months ending February 1, 1934, the mercury boiler and turbine unit at the South Meadow generating station of the Hartford Electric Light Company produced 124,955,000 kw.-hr. at an economy rate of 10,584 B.t.u. per kilowatt-hour. Of this net production 53,189,000 kw.-hr. was delivered by the generator driven by the mercury turbine and 71,766,000 kw.-hr. was produced by the associated mercury-vapor condenser-steam generator. The unit has a total rating of about 20,000 kw. Operation in 1933 began on February 13, following a period of six weeks used in pickling tubes and making changes which were seen to be necessary during the pickling process. Pickling was done to loosen a deposit of carbon about 0.001 in. thick on the inner surface of the tubing, a solution of hydrochloric acid being used for the purpose.

The principal outages in 1933 were one of six days in June due to replacement of leaky tubes and general cleaning up of the system, one of six days in September devoted to general overhaul, with repairs on the steam and water system, and one of thirteen days from November 8 used in replacement of a leaky tube, pickling of the mercury boiler and general cleaning up and overhauling.

As to Rates · · ·

Public Service Company of Northern Illinois' temporary electric rate reductions, recently ordered by the Illinois Commerce Commission, have been made permanent. The cut, estimated at $1,300,000 a year, had been accepted by the company.

Commonwealth Edison Company's rate case has been continued to May 29 to permit the company to prepare data requested by the commission. The information sought includes a statement of present fixed capital and additions to fixed capital by years since 1911. The commission also asked for a statement of 1933 operating expenses, excluding non-operating and non-utility items not properly chargeable to expenses for rate-making purposes. In addition the commission asked for a statement of intercompany and affiliated company payments in excess of $5,000 made in 1933.

Western United Gas & Electric Company's case has been continued until May 29 by the Illinois Commerce Commission.

Los Angeles Gas & Electric Corporation has announced reduced electric rates, covering domestic and commercial schedules. The new rates, subject to approval of the California Railroad Commission, will become effective for meter readings on and after June 1. Under the new domestic rate schedule customers who have been paying 2 cents per kilowatt-hour for energy over and above 175 kw.-hr. consumed in one month will receive a reduction to 1½ cents per kilowatt-hour for such excess. A rate of 1 cent per kilowatt-hour will be placed in effect where a special type of off-peak domestic electric water heater is installed on a separate circuit with a separate meter. New low rates also are to be set up for basic electrochemical and metallurgical industries.

Illinois Northern Utilities Company has been upheld by the Illinois Commerce Commission in a recent ruling establishing the right of a privately owned public utility to regulate its rates even though it may have been denied renewal of its franchise by the city. Some months ago the utility company was granted permission to reduce its electric rates in Geneseo to a level with those of the municipal plant, despite the fact that the city had refused to renew the company's franchise and had ordered it to vacate. The city's petition for rehearing has now been denied.

Southern Nebraska Power Company has obtained from the federal court a temporary injunction against the enforcement June 1 of a rate reduction order to rural patrons entered by the state Railway Commission. The power industry of the state is interested as the case raises the constitutionality of the new law, forbidding service charges. The question is also involved as to whether or not the commission has the authority to fix rural rates generally. Heretofore it exercised under a statute the right to fix costs when rural patrons secured enforced physical connections. The company has also raised the question of the commission's power to alter the terms of unexpired contracts made with patrons, where the only change made by the company was to absorb the old service charge in the first 12 kw.-hr. of consumption, with total charges undisturbed.

Rockland Light & Power Company's stay of operation of a reduced rate order, granted by the Supreme Court, has been upheld by the Appellate Division of the Third Department. The determination of the New York Public Service Commission, fixing temporary rates for the company, has also been annulled.

St. Lawrence County Utilities, Inc., rate investigation has been postponed. The company notified the New York Public Service Commission of its intention of filing a new rate schedule. The investigation was scheduled for May 17.

Central Arizona Light & Power Corporation has filed suit in the federal court seeking to restrain the state Corporation Commission from enforcing its recent order reducing electric rates 10 per cent and gas rates 33 per cent. The company maintains that the ruling violates the Fourteenth Amendment of the U. S. Constitution. The commission's order instructed the company to file new electric rates which would reduce gross revenues $200,000 annually. A depreciated value of $8,250,000 was placed upon the company's electric system and the rate of allowable depreciation was cut from 4 to 2½ per cent. At the same time the company was ordered to divorce the sale of merchandise and appliances from its regular utility operations by the setting up of a separate nonutility corporation to conduct its merchandising operations.

Mississippi Power & Light Company has reduced electric rates in Vicksburg $40,000 annually. The company's proposal for a reduction of approximately 10 per cent in Greenville has been rejected by City Council, which is asking a 15 per cent reduction effective July 1.

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Court Upholds Newcastle

Petition of the Public Service Company of Indiana for a permanent injunction to prevent the city of Newcastle from selling electricity to the general public has been overruled by Judge John Craig of Greensburg, sitting as special judge. William H. Evans, general counsel for the company, immediately filed notice that he would ask a new trial. This is the usual procedure under Indiana law, preliminary to an appeal to the Indiana Supreme Court. The city contended that it had sold energy to the public before any privately owned utility existed and that it had continued to do so up to the present time. Recently, however, the city increased the equipment of its electrical plant and decided to expand its distribution system. The company immediately filed a petition for an injunction.

Surplus Earnings Bill Vetoed by Lehman

Governor Lehman of New York has vetoed the Herman bill, amending the village law in Nassau County, in relation to the transfer of surplus earnings of the village lighting system to the village general fund for the purpose of reducing taxation. In vetoing the bill the Governor said: "The principle of this measure would run counter to the policy of the state as expressed in the enactment during this session of the bill permitting counties, cities, towns and villages to own and operate gas and electric light plants. In urging the enactment of that part of my program, I sought to give to the consumer of gas and electricity the opportunity of procuring his services at cheaper rates. . . . I did not have in mind the use of municipal plants for the purpose of shifting the burdens of government from taxpayers to consumers of utility services. . . ."

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New Plant for Watertown

Governor Lehman has approved the Cornaire bill, authorizing the city of Watertown to establish and operate a system or systems for supplying electrical energy to the city. The resolution of the Common Council proposing this undertaking was approved by the people at a special election. The city now owns a water-power plant and has a municipal plant which supplies electricity for street lighting and for lighting public buildings. The act just approved by the Governor gives the city power to enter into direct competition with Northern New York Utilities, Inc., one of the Niagara Hudson companies.

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Rockford Sanctions Plant

Voters of Rockford, Iowa, for the second time, May 15, sanctioned the construction of an $85,000 municipal light and power plant to be paid for out of earnings under provisions of the Simmer law. The vote was 371 to 134. At the first election the proposition carried 343 to 100. The Iowa Public Service Company, which serves the town, then sought an injunction with the result that the courts' attitude in similar cases led the Council to cancel a contract with the Fairbanks, Morse Company for plant erection. To clear up any existing legal difficulties Council authorized the recent election.

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Des Moines Election Off

Citizens of Des Moines, Iowa, will not vote on a municipal light and power plant proposal at the primary election on June 4. City Council took action to rescind the vote proposition when informed that procedure had been taken which would have compelled the city to build such a plant with money from a general obligation bond rather than from earnings of the plant as provided by the Simmer statute.

FINANCIAL · · · BUSINESS

Bankers Protest Utility Duplication

Federal program shows lack of "good faith," resolution holds. Committee report recommends unified accounting, shorter bond maturities for utilities.

Protest against "a lack of good faith" evidenced in federal support in supplanting existing privately-owned utility facilities was incorporated in a resolution adopted last week by the National Association of Savings Banks. Previously a committee report submitted to the conference made specific recommendations regarding utility fiscal practice. The committee report urged adoption of uniform accounting systems, better sinking fund methods and shorter bond maturities. The report advocated that savings banks use their influence to help promote fair and equitable rate decisions.

Terming government power operations as "by far the gravest problem which confronts not only this organization but every large investor in public utility bonds," the report stated:

"An example of justifiable apprehension is the possibility of duplication at public expense of adequate facilities already existing in a city in Tennessee. We understand that negotiations are in progress which may save the bondholders from loss. The threat of such loss has, however, been real. If it occurs it will be the result of combined local and federal action and will have every appearance of confiscation without compensation.

"It is not our function as savings bankers to oppose governmental development leading toward public ownership of public utilites. It is, however, our right and our duty to insist that such action be accompanied by either the purchase of existing facilities at a fair price or payment of just compensation for the resulting loss to bona fide investors."

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Ferguson Lays Ills to Holding Companies

Good underlying bonds of operating companies are as safe today as ever, Samuel Ferguson, president of the Hartford Electric Light Company, told the National Association of Savings Banks last week. He attributed present public criticism of utilities to the methods of certain holding companies.

"Many persons who thought they had made an outright purchase of a utility security," Mr. Ferguson said, "have now learned to their cost that what they really did was to buy a participation certificate in a gamble in utility securities conducted on a thin margin.

"This lack of understanding by the public of the difference between a holding company and a utility company is the root of, and reason for, much of the recent popular outcry against utilities. The Federal Trade and other investigations are showing up this situation with more and more clarity by each revelation headlined in the public press and the public is beginning to see the difference between the financial juggler of utility securities and the company which gives them daily service.

Condemns pressure for municipal plants

"It is really amazing," Mr. Ferguson said, "that when the federal government offers municipalities all the money needed for a plant and system, with the added inducement of 30 per cent as a gift, that so few have fallen for the political bait. How great is the political pressure can be readily seen from the truly remarkable letter sent out by the Deputy Administrator of the Public Works Authority urging that projects be put through without hearings, if possible; or, if not possible, without regard to any factual information furnished by the only parties in a position to know the economics of the situation."

Samuel Ferguson—"Good underlying bonds of operating companies are as safe today as ever."

Large additions to the utility tax burden provide the only cause for future apprehension, Mr. Ferguson held. "And even this cloud has a silver lining in the thought, which even our representatives in national and state legislatures eventually must see: Whence will come the funds that they now spend with such lavish hand if they 'kill the goose that lays the golden egg'?"

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Philadelphia Electric Power Sustained in $110,000 Suit

A United States District Court jury refused last week to award damages to Barton G. Levin and his brother Edwin in their suit for $110,000 against the Philadelphia Electric Power Company. The suit alleged devaluation of 170 acres of land for residential purposes, due, they claim, to the erection near by of high-tension transmission towers to aid in the operation of Conowingo Dam.

The result of the suit will have considerable bearing on the outcome of a number of similar actions by land and property owners along the line of the transmission system.

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Receiver Asked for General Gas & Electric

Receivership of the General Gas & Electric Company, an Associated Gas & Electric Company subsidiary, sought in a stockholders' suit filed in Wilmington, Del., was met this week by a demurrer action filed by the utility. The Chancery Court extended until after decisions on the demurrer the time for filing of answers of exceptions to questions attached to the complaint. Alleging the company is "hopelessly insolvent" as a result of stock manipulations exceeding $100,000,000, the suit asks the removal of John I. Mange and H. C. Hopson, president and vice-president of Associated Gas, and their associates from control of General Gas & Electric. The suit was filed by Elsie Levine and Abraham Hymanson. At the offices of the Associated Gas & Electric company last week officials stated that the transactions alleged in the suit were made known to stockholders through various public sources in the past. The company maintains not only that the transactions were profitable to General Gas & Electric Corporation but that there was no personal profit to any individual connected with Associated Gas.

SUSPENSE

Apparently contradicting the evidence of moderate seasonal decline shown by other business indicators, two major guides show upward tendencies. Energy production for the week ending May 19 gained appreciably, while preliminary estimates of carloadings foretold a contra-seasonal trend there, too. Steel activity, automobile production and bituminous coal output appear to be headed downward. Any major slump in general activity remains improbable. Commodity price averages touch the high point for the year. Security markets listlessly drift in dullest trading of years.

Silver, Congress, securities act, exchange regulation, NRA status, spreading strikes and threats of more, all add to the air of suspense which clouds the moment. Until Congress adjourns, or less favorable legislation is enacted, there is still hope that enough free play may be given business to permit capital goods industry expansion. Some Washington telltales, reviewing the securities act revision fiasco, even whisper that a large-scale recovery would be unwelcome to the forces of reform and that the measure will stand, therefore, with its capital-restricting clauses virtually intact.

Insull Ohio Units to Be Reorganized

Manufacturers Trust acquires properties in settlement of collateral notes—Bank also receives New England Public Service stock

Partial reconstruction of public utility companies in Ohio formerly controlled by the Insull interests is to be effected by the Manufacturers Trust Company through the Utility Service Company, which it controls. The plan involves a settlement or exchange of all claims and debts affecting the properties except those due directly to the new parent company. Principal among the obligations were notes due to the Chase National Bank and to the Penn-Southern Power Company and the Penn Central Light & Power Company.

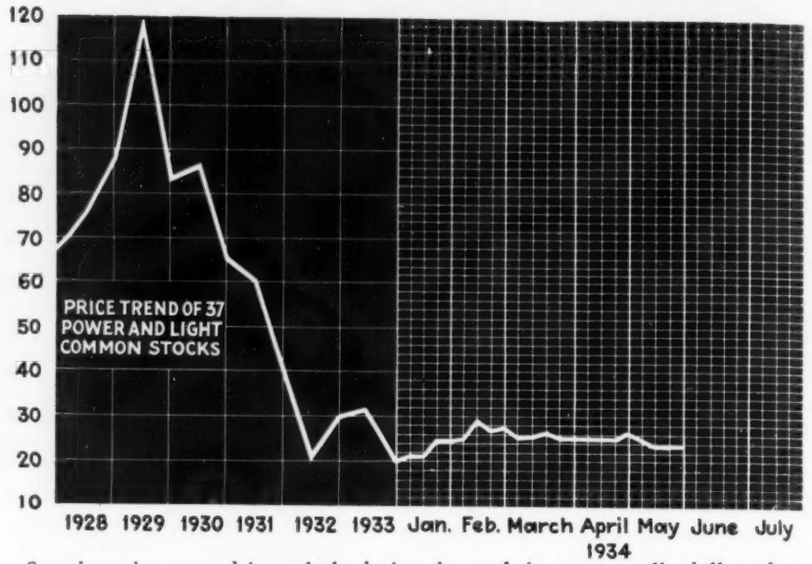
Under the agreement between the various creditors, the Utility Service Company has acquired all of the interest in the Central Eastern Power Company, Ohio Electric Power Company, Columbus, Delaware & Marion Electric Company and the Reserve Power & Light Company, including the collateral pledged by Central Eastern Power Company as security for its indorsement.

The Chase interests hold the common shares of the Central Utilities Service Company and the Buckeye Light & Power Company, which were formerly in the Ohio group.

Central Eastern liquidation

The Central Eastern Power Company is being liquidated so that the Utility Service Company will remain the direct owner of the Reserve Power & Light Company, Ohio Electric Power Company and Columbus, Delaware & Marion Electric Company. The Manufacturers Trust Company holds demand notes of Ohio Electric Power and Columbus, Delaware & Marion, each in the face amount of $1,000,000 acquired through merger with the Chatham-Phenix National Bank & Trust Company.

Utility Shares Advance Slightly



Security prices moved irregularly during the week in an unusually dull market. Changes in the utility group were slight. *Electrical World* index, 23.9; last week, 23.5

Virginia Electric Plans $8,316,000 Bond Exchange

An exchange offer to holders of its underlying bonds, outstanding in the amount of $8,316,000, will be made within the next few days by Virginia Electric & Power Company. The exchange will involve the first mortgage 5 per cent 30-year gold bonds, due 1936, of Norfolk & Portsmouth Traction Company; first consolidated mortgage 5 per cent gold bonds, due 1949, of the Norfolk Railway & Light Company, and Norfolk Street Railroad Company first mortgage 5 per cent gold bonds due 1944.

For each $1,000 principal amount of these bonds the company will offer $50 in cash, plus $1,000 principal amount of new Virginia Electric & Power Company first and refunding mortgage bonds, series B, 5 per cent, due 1954. The new issue will be equally secured with the outstanding series A bonds under this same mortgage, the statement of the company reports.

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Commonwealth & Southern Reports Capital Outlays

Capital expenditures of $7,723,317, represented mainly by additions and improvements in its transmission and distribution systems, were revealed in the annual report of Commonwealth & Southern Corporation for 1933, issued this week. Total energy sales of subsidiaries were 4,147,338,555 kw.-hr. in 1933, against 3,906,983,386 in 1932. The addition of nearly 15,000 meters brought the total meters of the system at the end of the year to 1,032,574.

Current Earnings Reports of Electric Light and Power Companies

	1934	1933	Per Cent Increase	Operating Ratio 1934	Operating Ratio 1933
Operating Companies					
Louisville Gas & Electric (Year ended February 28)					
Gross earnings	$9,731,812	$9,901,601	— 1.7	55	56
Net earnings	4,346,658	4,336,084	0.2		
Net balance	3,036,054	3,058,283	— 0.7		
Niagara Falls Power (Year ended March 31)					
Gross earnings	9,789,432	9,421,268	3.9	43	43
Net earnings	5,576,641	5,342,998	4.4		
Net balance*	3,808,525	3,506,803	8.6		
Oklahoma Gas & Electric (Year ended February 28)					
Gross earnings	10,532,985	10,629,129	— 0.9	61	59
Net earnings	4,140,065	4,289,161	— 3.5		
Net balance	1,740,836	1,885,980	— 7.7		
West Penn Power (Year ended March 31)					
Gross earnings	17,530,419	16,043,556	9.3	51	53
Net earnings	8,537,305	7,452,420	14.5		
Net balance	4,752,467	3,907,174	21.6		
Holding Companies					
Columbia Gas & Electric and subsidiaries (Year ended March 31)					
Gross earnings	$77,909,488	$79,172,043	— 1.6	69	64
Net balance	5,904,631	9,959,131	—40.7		
Mohawk HudsonPower and subsidiaries (Year ended March 31)					
Gross earnings	35,757,526	35,198,024	1.6	64	60
Net balance	4,401,492	6,323,312	—30.4		
Niagara Hudson Power and subsidiaries (Year ended March 31)					
Gross earnings	71,376,670	70,716,908	0.9	57	54
Net balance	6,386,357	7,436,328*	—14.1		
North American and subsidiaries (Year ended March 31)					
Gross earnings	106,435,639	110,234,739	— 3.4	65	63
Net balance	9,678,832	12,144,629	—20.2		
Northern States Power and subsidiaries (Del.) (Year ended February 28)					
Gross earnings	31,197,481	31,978,749	— 2.4	63	60
Net balance†	5,624,437	6,799,498	—17.4		

*Changed to give effect to major adjustments. †Available for all dividends.
Gross earnings—(Operating Companies) Gross operating revenue. (Holding Companies) Gross operating revenue plus other income. Net earnings—Earnings after deduction from gross earnings of operating expenses taken to include taxes, depreciation, maintenance, operating, etc. Net balance—Balance available from income for common stock dividends.

Boulder Dam to Have 287-Kv. Transformers

Eleven power transformers for Boulder Dam, seven of which are rated 55,000 kva. at 287,000 volts, the highest commercial voltage of any transformer ever built in the United States, have been ordered under a federal contract from the General Electric Company. The larger transformers are water cooled, will weigh over 400,000 lb. each and are approximately 32 ft. high, 20 ft. wide and 13 ft. deep. The four smaller transformers are rated 13,333 kva. at 138,000 volts and are forced-oil cooled. Shipment of the transformers, to be manufactured at the Pittsfield, Mass., works, will begin in about a year. The order is valued at about $1,000,000.

Also for Boulder Dam, the Schenectady works of General Electric is now building two 82,500-kva. generators which will be connected to 115,000-hp. waterwheels.

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Fibre Conduit Company Has New Sales Agent

Sale of Orangeburg fiber conduit, manufactured by the Fibre Conduit Company, is now handled through the Graybar Electric Company and the General Electric Supply Corporation. Johns-Manville Corporation, former sales agent for Orangeburg fiber conduit, will introduce a new type of conduit to be known as "Transite."

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McGraw Electric Dividend

Increased net profits for the first quarter of 1934 have resulted in the declaration of a special dividend of 25 cents a share on the common stock of McGraw Electric Company. The disbursement, payable June 1 to stock of record May 22, is the first common payment since October 1, 1931, when a 25 cent disbursement was declared.

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Weston Net Totals $43,979

For the quarter ended March 31 Weston Electrical Instrument Corporation and its domestic subsidiary report a net profit of $43,979 after federal taxes, depreciation and other charges. This sum is equal, after $2 class A dividend requirements, to 16 cents a share on 160,583 no-par common shares, contrasted with net loss of $47,298 in the first quarter last year.

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P.W.A.'s Electrical Orders

Electrical manufacturers obtained orders valued at $8,028,000 for materials to be used on P.W.A.-financed projects in the period from October 1, 1933, to March 31, 1934, the Bureau of Labor Statistics reports. Total orders for all classes of materials for both federal and non-federal projects amounted to $188,857,741 in the period covered. Electrical machinery and supplies accounted for $7,402,708, lighting equipment for $517,492 and refrigeration for $170,800.

New York Metal Prices

	May 15, 1934 Cents per Pound	May 22, 1934 Cents per Pound
Copper, electrolytic	8.50*	8.50*
Lead, Am. S. & R. price	4.25	4.00
Antimony	8.60	8.375
Nickel ingot	35.00	35.00
Zinc, spot	4.70	4.70
Tin Straits	53.00	53.125
Aluminum, 99 per cent.	23.30	23.30

*Blue Eagle

German G.E. Reduces Loss

German General Electric reports 180,000,000 marks sales for the fiscal year ended September 30, 1933, against 220,000,000 marks in the preceding fiscal year. Net loss for the period was 26,500,000 marks, against 72,700,000 marks net loss in the preceding period.

SALES OPPORTUNITIES IN NEW CONSTRUCTION

Spot coverage of the week. Projects approved and proposed, bids requested, equipment wanted, funds available. Prospects for the electrical manufacturer.

McPherson, Kan. — Asks bids until June 5 for complete equipment for new city-owned electric light and power plant. Fund of $210,000 has been arranged.

Wellsville, Ohio—Ohio Power Company, Newark, Ohio, has approved plans for extensions and improvements in power substation at Wellsville, including installation of new equipment. Cost about $65,000.

Seek, Pa. — Lehigh Navigation Coal Company plans installation of motors and controls, electric hoists, pumping equipment, conveyors, etc., in proposed rebuilding of local Greenwood Colliery.

Portland, Ore.—United States Engineer Office asks bids until June 26 for two hydraulic turbines and accessories (Proposal 662).

Pullman, Wash.—University of Washington plans call for bids in June for new power plant at institution. Fund of $225,000 has been secured through Federal sources.

Cleveland, Ohio—Ackerman Rubber & Plastic Molding Company, East 200th Street and New York Central Railroad, Euclid, recently organized, plans installation of motors and controls, conveyors, regulators, etc., in new plant, location noted, where building has been leased. About $50,000 will be spent for equipment.

Corning, Iowa—City asks bids until June 12 for complete equipment for new city-owned electric light and power plant, including Diesel engine-generating units and accessories; also for electric distribution system. Fund of $160,000 available.

Memphis, Tenn.—Tennessee Valley Authority, Knoxville, Tenn., plans early surveys for high-tension transmission line to Memphis and vicinity, in connection with Norris Dam hydro-electric power project. Cost about $3,000,000 with steel towers, power substations, switching stations and other structures.

Walla Walla, Wash. — Construction Service, Veterans' Administration, Washington, D. C., asks bids until June 12 for extensions and improvements in street-lighting and fire-alarm sytems at institution at Walla Walla.

Detroit, Mich.—Regal Brewing Company, 2262 First National Bank Building, recently organized, plans local plant. Cost about $100,000 with equipment.

Canandaigua, N. Y. — City has engaged L. C. Reynolds, Geneva, N. Y., consulting engineer, to make surveys and estimates of cost for city-owned electric light and power station, and distributing lines. Preliminary estimates over $225,000.

Athens, Ohio — Ohio Mining Company plans rebuilding of power house and electric repair shop, recently destroyed by fire. Loss about $100,000 with equipment.

Carthage, Ohio — National Distillers Products Corporation, New York, N. Y., plans installation of motors and controls, electric hoists, conveyors, etc., in multi-story storage and distributing building at distillery at Carthage. Cost about $225,000.

Mineral Wells, Tex.—Purity Products Corporation plans installation of motors and controls, electric pumping machinery, refrigerating equipment, mechanical drying and other equipment in new water crystal plant. Cost approximately $65,000.

Neodesha, Kan. — Has authorized early purchase of equipment for city-owned electric light and power plant, including Diesel engine-generator unit and accessories. Cost about $48,000.

Sutherland, Neb.—Platte Valley Public Power & Irrigation District has authorized bonds for $7,492,382, approved by Public Works Administration, for hydro-electric power and irrigation project, and has engaged Parsons, Klapp, Brinckerhoff & Douglas, New York, N. Y., consulting engineers, to make surveys, plans, etc. Large hydro-electric generating station will be built on Platte River, near Keystone, with transmission lines, power substations, switching stations, etc. Series of electric-operated pumping plants planned.

Baltimore, Md.—Consolidated Beef & Provision Company will install motors and controls, refrigerating equipment, conveyors, etc., in two additions to packing plant. Cost about $90,000.

Cloquet, Minn. — Berst-Forster-Dixfield Company, New York, N. Y., plans installation of motors and controls, regulators, conveyors and other equipment in proposed addition to match and woodenware plant at Cloquet. Cost over $150,000, of which more than three-fourths will be used for equipment.

Falmouth, Mass.—Town has surveys and estimates of cost under way by Metcalf & Eddy, Boston, Mass., consulting engineers, for city-owned electric lighting plant.

Seattle, Wash.—Silver Foam Brewing Company has plans for new multi-story plant and will begin construction in June. Cost about $150,000.

MEN OF THE INDUSTRY

M. C. Hansen has been named general superintendent of the South Bend district of the Northern Indiana Public Service Company. Mr. Hansen was formerly district manager at Elkhart.

P. R. Williams was recently named comptroller of the Virginia Electric & Power Company with headquarters in Richmond. Mr. Williams was formerly treasurer of the Gulf States Utilities Company, Beaumont, Tex. He has been identified with the Stone & Webster organization since 1909.

James L. Washburn has joined the sales department of the Cleveland Electric Illuminating Company. For the past several years he has been identified with the Westinghouse Electric & Manufacturing Company. In his new position Mr. Washburn will work on electric range promotion.

P. J. Cross, who from 1921 to 1931 was associated with the engineering activities of Combustion Engineering Corporation, has rejoined the engineering department of the present organization, Combustion Engineering Company, Inc. He will be engaged in development and research work. Prior to 1921 Mr. Cross was with the U. S. Bureau of Mines and was identified with a number of notable investigations on the burning of fuels.

Arthur T. George has joined the National Recovery Administration as attorney on public utility affairs with headquarters in Washintgon, D. C. For the last five years Mr. George had been chief counsel of the California Railroad Commission. During his service with that body he successfully defended the commission's orders before the California Supreme Court in some seventy-one cases, and before the U. S. Supreme Court in various appeal cases.

C. E. Fairburn will succeed **Lieut-Col. F. A. C. Leigh** as electrical engineer of the London, Midland & Scottish Railroad. Mr. Fairburn joined the English Electric Company in 1919. He organized and built up a heavy traction department for railroad electrification. Later he became general manager of the Preston works of the company. In 1928 he was appointed general manager of the company's Stafford works, retaining the general managership at Preston. In 1931 he moved his headquarters to London, where, as chief engineer and manager, he took charge of all the traction business, including railroad, trolley, bus, street car and substation plant work. Last year, when the English Electric and the Metropolitan Vickers Electrical Company obtained a contract for the electrification of the Polish State Railroads, Mr. Fairburn became chairman of the contractors' committee to carry out both the financial and technical phases of the work. Lieut.-Col. Leigh was responsible for the equipment of many corporation power stations. In 1923, following the regrouping of the great British railroad systems, he joined the London, Midland & Scottish and two years later, upon the formation of a separate electrical department, was appointed electrical engineer for the entire L. M. S. system. He will remain with the system in an advisory capacity.

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W. J. O'Brien Heads Memphis Utility

W. J. O'Brien was elected president and general manager of the Memphis Power & Light Company May 15 by the board of directors. Mr. O'Brien, who is succeeding the late W. D. Kyser, was formerly vice-president and general manager. A native of New Orleans

and a graduate of Purdue University, Mr. O'Brien received his early experience in the public utility field with the Denver Gas & Electric Company, the Pueblo Gas & Fuel Company, the Helena Gas & Electric Company and the Corpus Christi Railway & Light Company. Subsequently he became affiliated with the Niagara, Lockport & Ontario Power Company.

It was in 1926 that Mr. O'Brien went to Memphis as assistant to the president of the Memphis Power & Light Company and one year later he was elected to the position of vice-president and general manager.

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Frank H. Merrill has organized the Simplet Electric Company with offices in Chicago to manufacture a line of conduit fittings to be known as "Simplets." For 30 years Mr. Merrill was connected with the Appleton Electric Company and at the time of his resignation was vice-president in charge of eastern sales. **Arthur S. Merrill,** his brother, will be associated with him as treasurer. He was connected with the Chicago Fuse Manufacturing Company for many years as general sales manager. For the past twelve years he acted in the same capacity for the Appleton Electric Company, in addition to being director of the company. **E. G. K. Anderson** has also become associated with the Simplet company. For many years he was chief engineer of the Appleton company.

Ralph P. Brown has entered the advertising department of the Timken Roller Bearing Company and the Timken Steel & Tube Company. Mr. Brown is a graduate engineer and has had a wide experience in writing for the industrial press. He was formerly in charge of publicity for the National Lime Association and the Brown Instrument Company. Recently he has been conducting an independent business paper editorial service in Cleveland.

Dale D. Merchent has been appointed manager of the Elkhart district of the Northern Indiana Public Service Company. Mr. Merchent was formerly manager of the Valparaiso district of the company. **Carl D. Rees** has been selected to succeed him. Mr. Rees was formerly superintendent of the company at Michigan City. **Walter H. Hathaway** has been assigned the position formerly occupied by Mr. Rees. Up to the present time he was assistant general foreman of the electric operating department at Plymouth.

Herbert R. Stuart has been appointed protection engineer of the New England Power Engineering & Service Corporation, with headquarters at Boston, Mass. Mr. Stuart was a research assistant at the Massachusetts Institute of Technology for a year following his graduation in 1925 from the electrical engineering course, and then was in the general engineering department of the Westinghouse Electric & Manufacturing Company at East Pittsburgh for eighteen months. For the past seven years he has been a sales engineer in the central-station department of the Westinghouse Boston office. In his new position he is succeeding Hugh H. Spencer, resigned.

William Lloyd, for many years identified with the design, manufacture and sale of Coxe stokers, has again become associated with the engineering department of Combustion Engineering Company, Inc., in much the same capacity as that of some years past. While mechanical superintendent for the Lehigh Valley Coal Company, Mr. Lloyd became interested in the development of the Coxe stoker and was responsible for many of the earlier installations. In 1914 he became president of the Coxe Traveling Grate Company and later was made president of the Coxe Stoker Engineering Company, which subsequently was affiliated with Combustion Engineering Corporation.

Eloise Davison has been appointed to direct Electric Home and Farm Authority's domestic electric service program. Miss Davison brings to her new position broad experience in the home economics field. From 1918 to 1922 she served as household equipment and management specialist at Ohio State University and the next five years

she spent on the staff of Iowa State College as home economics instructor and consultant. In 1927 she was appointed home economics adviser of the National Electric Light Association, the position she occupied until 1932. Recently she has been connected with the bureau of home economics in the United States Department of Agriculture. Miss Davison's offices will be in Chattanooga.

Kinsey M. Robinson was elected president and general manager of the Idaho Power Company at a recent meeting of the board of directors. Since last August Mr. Robinson has been vice-president and general manager.

OBITUARY

Alvin A. Neumann, sales manager for the Crescent Insulated Wire & Cable Company, Trenton, N. J., died suddenly May 13, as the result of an automobile accident. He was 32 years of age.

Frank J. Durkin, manager of the General Electric Supply Corporation at Newark, N. J., died May 19, of a heart attack, at the age of 44. Mr. Durkin had recently served as secretary of the local Electrical Supply Code Authority under the NRA.

James R. Tiffany, a member of the sales engineering staff of the Boston office of the Westinghouse Electric & Manufacturing Company and a specialist in power plant equipment, died at the Chester Hospital in Cambridge, Mass., May 14, as the result of an infection. He was born at Walpole, Mass., in 1893 and was graduated from the engineering school of Tufts College in 1924. He had been connected with the Westinghouse organization since that time.

Dr. William Hoskins, noted chemist, died May 18 at his home in La Grange, Ill., following a year's illness. He was 72 years of age. He was president of Mariner & Hoskins, consulting chemical engineers, and of the Hoskins Process Development Company. Dr. Hoskins' professional activities were primarily along industrial lines. He made many important contributions to the development of resistance wire now generally used in heating devices. Dr. Hoskins was the author of numerous technical papers and a member of many scientific societies.

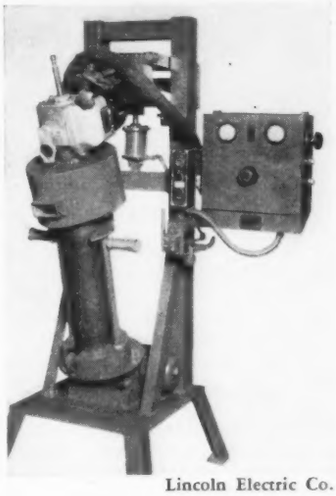
Franklin P. Lannon, formerly a member of the Colorado Public Utilities Commission, died at his home in Palisade, Colo., May 5.

Leonard J. Farrell, chief engineer of the Public Service Company of New Hampshire and its predecessor, the Manchester Traction, Light & Power Company, since 1897, died suddenly at his home in Manchester May 14, at the age of 73. He was also superintendent of the Brook Street station of the company at the time of his death.

NEW EQUIPMENT

Automatic Welders for Automobile Mufflers

Automatic machines for welding automobile muffler assemblies by the shielded carbon arc process are announced by the Lincoln Electric Company, Cleveland, Ohio. The machines, equipped with Electronic Tornado welding heads, are said to have a production capacity of 115 mufflers per hour.



Lincoln Electric Co.

The equipment used consists of two machines, one a vertical machine, as shown in the accompanying illustration, and the other a horizontal unit. With the welder illustrated the operator places the muffler in position, lowers the welding head, edge-welds the tubes in place, raises head and turns muffler upside down and welds the pipe on the other end. The complete operation requires 30.5 seconds. Approximately 118 mufflers per hour may be welded with this machine. Actual welding is at the rate of 63 ft. per minute. The second machine lap welds muffler tubes for connection to the exhaust pipe. Floor-to-floor time is 112 mufflers per hour.

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Coxe Stokers Enlarged

To adapt the well-known Coxe stoker to wider furnaces and larger capacities in the burning of small-sized anthracite, coke breeze, lignite and certain non-caking bituminous coals, under forced draft, Combustion Engineering Company, New York, has introduced the CD design. Two or more carrier bars placed end to end are used instead of a single bar which was limited in length by warping. Bars are keyed by overlapping cast-iron keys to prevent ash being brought back to the front of the furnace.

The stoker body is built up of structural steel cross members which support the skids and grate surface instead of the skids being supported on the box structure comprising the several air compartments. Plates attached to the cross members form a trough and steam or air jet blowers are placed at the sides to blow siftings into the trough. The air is distributed to compartments from air chambers beneath the side walls and the use of ducts is avoided. Handwheels permit individual air control to each compartment; preheated air may be employed. The larger design is driven from the rear shaft with take-up located at the front. Widths of 12 to 24 ft. are offered instead of a maximum of 11 ft. 8⅝ in. in the single-bar design.

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Double-duty convenience outlets which provide for grounding appliances and which also serve all standard two-wire plugs have been announced by the merchandise department of the General Electric Company, Bridgeport, Conn. Both double-duty outlets GE-2989 and GE-2988 are for use in two-wire circuits and have combination slots with which either a standard three-pole cap or two-pole cap may be used in case present rules do not require appliance grounding. The first is for permanently grounded and the second for ungrounded systems. For three-wire circuits, the GE-2990 outlet is used, with ground contact attached to an identified ground terminal, and meets present conditions in which grounding is necessary and anticipates future grounding rules.

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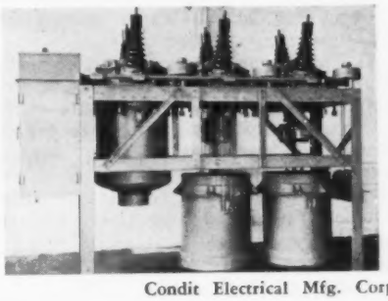
High-Voltage Breakers

Frame-mounted, high-speed, outdoor oil circuit breakers (type FZO-50) have been announced by the Condit Electrical Manufacturing Corporation, Boston, Mass. The line is furnished in the various ampere, voltage and interrupting capacity ratings comprising the N.E.M.A.-E.E.I.-A.E.I.C. standard steps for such units from 15 to 69 kv. An outstanding feature is a new interrupting device (the Condit "ZZ Ruptor"), in which the arc is drawn in a specially designed inclosing chamber. This device is designed to reduce arc voltage and energy, pressure, oil throw, oil deterioration and contact burning, with corresponding diminution of maintenance. Other points of interest empha-



Condit Electrical Mfg. Corp.

sized are new oil-filled bushings of liberal design, low-inertia, high-speed flat-angle mechanism, a spacious control cabinet with folding doors at sides and front, rigid cast pole tops and steel plate tanks with high dielectric liners.

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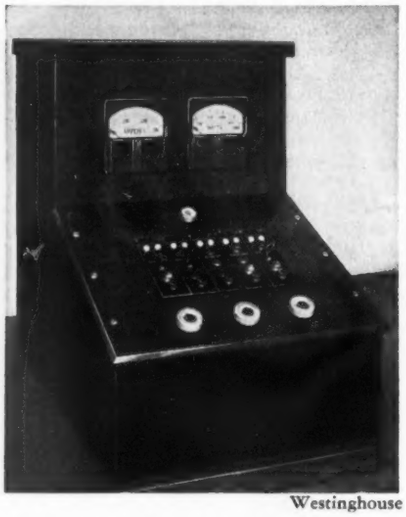
Supervisory Control for Small Stations

To meet the demand for an inexpensive means for remote operation of various small stations the Westinghouse Electric & Manufacturing Company announces "Polaricode Junior," a low-cost, small-size supervisory control. The control is particularly suitable for industrial plants. The units include a raise-lower control combined with simultaneous telemetering indication of position for distant control of variable position apparatus such as valves, rheostats, tap changers and similar equipment. Polaricode, Jr., units are designed for application to small transformer switching, distribution and tie-point substations, various single unit automatic railway, mining and hydro stations, electric pumping stations, industrial plant substations and similar applications.



Westinghouse

Except for size, the unit is comparable to all Westinghouse supervisory control systems. It operates a maximum of five apparatus units—a size small enough to permit low cost, yet sufficient for the average small application. Only two telephone-type line wires are required between the dispatching point and the remotely controlled station. The dispatching cabinet is but 14 in. wide, 21 in. deep and 20 in. high.

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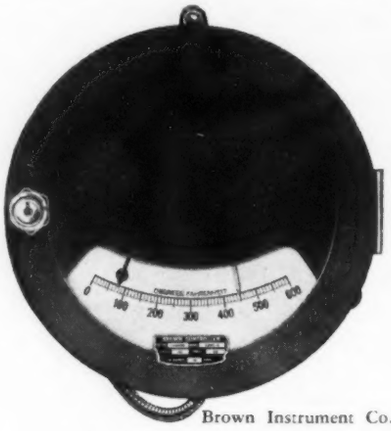
Indicating Thermometer Mercury-Switch Controller

Automatic control indicating thermometers have been announced by the Brown Instrument Company of Philadelphia, Pa., which use mercury switches to eliminate open make-and-break contacts controlled by the pointer. Every six seconds a motor-driven control table determines the location of the pointer in reference to the control setting and tilts the mercury switch from one side to the other if the temperature has changed. The measuring mechanism is free to position itself, unhampered by the control mechanism; there is no excess weight on the pointer, and switch is positioned with a positive action of the motor instead of by friction. Mercury switches are unaffected by vibration and corrosion and dirty contacts are eliminated. The capacity of the mercury switches is 15 amp. at 110 volts or 10 amp. at 220, so external relays are eliminated in most applications. Control is adaptable to one-, two- or three-contact control or signaling systems.



Brown Instrument Co.

The new controller is equally adaptable for control of pressure, liquid level and similar factors, as well as temperature. All models are furnished in circular 10-in. universal cases.

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Floodlight Projectors

Open floodlight projectors for filling stations and sports lighting, type AL-45, have been announced by the General Electric Company, Schenectady. Constructed to withstand all weathering, the units are made of porcelain-enameled steel with cap fittings of cast aluminum. Reflectors have a symmetric distribution for best use of light on service station and general sports areas. Reflecting surfaces are glossy white with weather-resistant fire-baked porcelain-enamel finish that can be cleaned with soap and water to restore original efficiency.

General Electric Co.

All sizes of large lamps, from 300 to 1,500 watts, may be used by utilizing an easily adjusted socket support. Watertight bushings of brass with rubber gasket, brass packing and clamping nut prevents leakage around entrance leads. Several mountings are offered of cadmium-plated malleable iron. Crossarm mounting is illustrated.

ENGINEERING DATA FROM MANUFACTURERS

Bulletins and catalogs now available to engineers by manufacturers and associations

Precision Insulators made from lava, alsimag, alumina, beryllia, magnesia, Bulletin No. 34 of the American Lava Corporation, Chattanooga, Tenn., 27 pages. The electrical and physical properties and applications of lava and alsimag electric and heat resisting materials which are made to order in practically any shape. Gives illustrations of many typical shapes in which these and associated special products have been made, and some of which are stocked or can be readily made. Alsimag is a pressed or extruded material which is a double silicate of alumina and magnesia in several different bodies depending on properties desired; lava is a natural product, steatite, mined in three grades, shaped and kiln hardened.

Expulsion Protective Gaps for the protection of transmission-line insulation against lightning flashovers and resultant line outages, Bulletin GEA-1858A of the General Electric Company, Schenectady, N. Y., 11 pages, May, 1934. Describes the construction, principle of operation, life, installation and application of General Electric expulsion protective gaps with illustrations and drawings. Selection of proper gaps and accessories is treated and types available listed.

Westinghouse Diesel Electric Locomotives, Circular 1994 of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., 80 pages, May, 1934. Describes in four parts the Diesel electric locomotive, its economies and field of application, and general advantages; the features of Westinghouse standard Diesel electric locomotives; sketches and performance data on all standard types, and properties and illustrations of locomotives now in service.

Don Graf Data Sheets on the use of "Diamond H" remote-control switches for draftsmen, Sheet No. E3 of the Hart Manufacturing Company, Hartford, Conn., 8 pages. Shows how Diamond H remote-control switches permit ordinary toggle switches or other devices, conveniently placed, to control heavy electrical loads at any location without expensive wiring. Besides catalog listings and general material control of large lighting loads, group control of theater lighting, automatic emergency changeover of service, wiring lights for emergency protection and time clock lighting control are treated.